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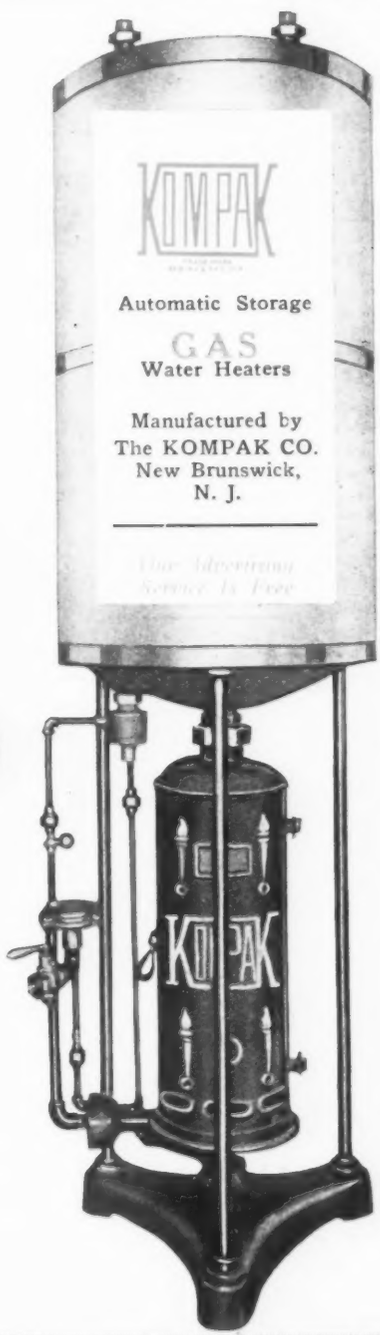

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THE KOPPERS COMPANY

PITTSBURGH, PA.

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No Force in the World Can Stand Up Against Aroused Public Opinion

A Hint to the Utility Operator in Forestalling Interruptions to an Essential Service

By WALTER A. FAIRSERVIS

One of the unusual phases of the labor situation in the United States is the almost universal condemnation of the newspapers of all strikes and public utility demonstrations in particular. Yet, despite this determined opposition the country to-day is faced with more labor unrest than at any period in its history.

So marked has been the attitude of the newspapers in general that the writer believed it well worth while to get the personal opinion of editors regarding the labor problem and its probable solution. Most editors talked freely, but they were almost as one man in their request that their names be withheld, declaring that they had gone as far as they believed wise in their own columns.

Perhaps the one paper that has made any serious attempt to gather and present all of the facts in most of the labor troubles of the United States has been the New York *World*. Editorially they have not hesitated to call a spade a spade and they have spared no expense to gather all of the facts that were obtainable, and which had any bearing on this problem. Now it is true that the New York *World* has not been particularly friendly toward public utility operators as a rule; in fact, the newspaper has made it a habit to condemn most large companies, but, despite this, the *World's* attitude throughout all of the labor unrest has been fair to both capital and labor and has criticised impartially.

When a strike was called recently among the men of the Brooklyn Rapid Transit Company the *Evening World* warned the men that the strike would not be a success unless public opinion backed up the men. It was only a short time after the men left their work that this proved to be the case and the *World*, which had not taken up the case of the executives in charge of the company, was completely vindicated. This is merely recited to show that newspaper owners and editors are not given to expressing editorial opinion without full information. Nor are they given to talking unless they know whereof they speak. So we would ask the reader to bear these facts in mind during the remainder of this article. Each opinion expressed we can vouch for as being authentic, the names being withheld for the reasons given before in this article.

Said the first editor we visited: "I view this question of labor trouble from perhaps a different angle than most people, for I believe that strikes are only an expression of the laboring element in its efforts to reach a higher standard. Don't misunderstand me. By that I don't say that strikes are right, or that I sympathize with them, for I don't. But that we have strikes is due to the more educated classes. I mean to say that neglect of our fellow humans and disregard of their rights has caused the unrest. If we could show labor some other way of expressing its desires I am positive that there is not a man in the country to-day, barring perhaps the radical element, that would use the weapon of separating from his work. For, it seems to be little known, that strikes cost labor more than they do capital. To capital it simply means that production has ceased, that its money is not being turned over, whereas to labor, it means that its only source of income has stopped abruptly and that its progress has been halted."

"That's all very well," we said, "but how about public utility strikes?"

"I don't know one man who defends public utility strikes," was the quick response. "To me there is no excuse for instigating a strike that inconveniences the public or that endangers either its well-being or life. And by instigating the strike I mean either for labor or capital. If capital will do its part in meeting the changed conditions and if the authorities that have jurisdiction over the operation of public utilities will have courage enough to meet an issue squarely then I feel safe in saying that there will be no cause for strikes, and with this removed there will be no strikes."

Just exactly the part that capital was to play in removing the cause of a strike was not quite clear to the writer so we asked for an explanation.

"That's easy," was the answer. "The trouble with the financial leaders in the past has been to much secrecy. They have clouded their businesses and activities in too much mystery, with the result that there is no general understanding of their problems. If public utility operators will work in the open, if they will ex-

plain the reasons for any action and will take the trouble to see that the public generally is informed of what is taking place then one of their greatest troubles is going to be removed and public opinion generally is going to get in back of them; and let me say right here, there is no force in the world that can stand up against an aroused public, or, to put it more mildly an educated public."

"Granting that this is true," we put in, "we run up against a condition in the regulatory bodies which says that a public utility company has no right to spend money for propaganda."

Refusing to Barter with the Undesirable Type of Regulator

"Certainly that opposition is going to be encountered," said the editor, "but that is the most ridiculous statement that could possibly be made. This word propaganda came into general use during the war and the result has been that when anything disagreeable to us has been brought to light the cry of 'propaganda' has at once been set up. Certainly there will be such a cry, but the companies themselves are to blame. Just as long as they are willing to stand for this type of public official and try to barter with them just so long is the hue and cry going to be raised. But once let some few individuals or companies take a determined stand, show that they are prepared to put up a stiff fight, and this opposition will at once be swept away."

"Then your solution of the labor problem as applied to public utility companies is publicity?"

"Absolutely yes, provided that there is fair and broad-minded action in back of it and provided that there is a real effort made to cope with problems of individual workmen, so that there is a fair chance given to all; to paraphrase 'to live and earn.'"

Most of the editors we talked with, however, were more reticent when it came to discussing a remedy, but there was no disagreement in the statement that the sooner this labor question is settled the sooner the country will get on a new basis that will work for greater advancement of all.

"We can look for no definite action until after the presidential election is over," declared one veteran newspaper man. "In the first place neither political party is ready to assert itself for or against capital or labor, and when a political party ignores an issue it is pretty near a safe bet that the public is not ready to assimilate any changes of any kind. But there are certain indications that a close observer will see in the way in which public opinion is pointing. It is only a short time ago that the number of strikes that were taking place was a joke. In fact, newspapers tabulated the number of trades that were on strike and the humorists made jokes about the men who were out of work. Then, one day the country awoke to find that strikes played a mighty important part in the cost of living. It was enough to force the discontinuance of a great number of strikes but not strong enough to cause any drastic National action. When that day comes then watch the feathers fly and see how quickly action will be taken."

National Laws Needed

This editor was firm in the belief that the only solution of the labor problem would come by national laws which would definitely state the rights of both capital and labor. He said that the framing of the laws would consider the interests of the public as paramount and with this as the starting point the bills would be drawn. But he failed to state, in fact flatly refused to predict, the nature of the legislation that would take place.

Another powerful editor declined to discuss the question, but instead referred the writer to a social worker of long experience and keen observation for a viewpoint of labor.

On the lower East Side of New York, we found this social worker—a woman of great mental power and one who had not only done wonderful work in her chosen field but who had been a nurse abroad during the World War. In the light of her experience with the men of the army and with the manual laboring class as a whole we were anxious to get her viewpoint. Inasmuch as the neighborhood we found her in was known as a foreign quarter the first question asked was in regard to the radical element.

"Perhaps you would call them the 'foreign element,'" she said. "But strange as it may seem, most of those whom I find are on strike are American born of foreign parentage. Take for instance just one case that has come to my notice within the past few days. The bread-winner of the family was American born, had married a girl of his own race and had made his living in a gas plant for many years. He was a drifter; had wandered from company to company during his working career, always chasing the few extra dollars that might be offered to him. When the men of one plant decided to demand a raise or threaten to strike he was one of the leaders. Most of the men were conservative in their demands but he insisted on a tremendous increase in his pay and when it was not forthcoming exactly as he wanted he went on a one-man strike. Of course his leaving didn't cripple the plant. Probably it was a good thing that he did go for his fellow workmen but it was a bad thing for labor as a whole because he decided that he would do no more work until he had accomplished his ends.

"In place of seeking other work he became an agitator and a radical and now he is a leader of a group of radicals in thought that while they have committed no violation of law are a disturbing element in the orderly progress of the day."

American Ideals of Service

Numerous other cases were recited, all of similar nature, and all having a direct bearing on the case of labor versus capital. Education of a new sort was the solution offered by the social worker, not education as to industrial methods but education as to American ideals of service.

American ideals of service was a new thought, but we are inclined to agree particularly with reference to our industry. Service has been a tradition among all gas company men, high and low alike, we found, and if this ideal could be inculcated into the younger men then strikes would become a thing of the past. Men who had labored long in the service of gas companies all had this ideal, were all impressed with their duty to the public and were content to stick at their work, firm in the belief that in the end they would secure their just reward. Perhaps this is not just the way in which it is expressed but it is the underlying thought of most of the men.

But, and here lay the kernel of the nut, the men felt that they must be regarded as human beings by those

(*Continued on page* 264.)

The Oil Shale Industry in Scotland and England

Victor C. Alderson, President of Colorado School of Mines, Analyzes Methods Successfully Employed Abroad and Bases Suggestions on These Findings for Utilization of American Shales

In Scotland, oil shale is an established industry, operative since 1850, and embraces the mining of the shale, the retorting or production of crude shale oil, the refining of the oil into its various commercial products, and the marketing of these products, declared Victor C. Alderson, president of the Colorado School of Mines, in an address before the meeting of the Independent Oil Men's Association held at Denver, Sept. 29. The profit on each ton of shale mined is approximately two shillings or, under normal exchange, 50 cents. For each ton of shale mined there is one employee; i. e., the total number of employees of all kinds is virtually the same as the number of tons of shale mined each day. The oil-shale problem in Scotland embraces the cost of supplies, cost of labor, efficiency of labor, and selling price of the marketable products; in other words, the margin between the cost of production and the selling price. In England the problem is quite different. There are no commercial oil-shale plants. There are extensive deposits of oil shale, rich in oil, but, unfortunately, there is an excess of sulphur, 6 or 8 per cent or more. This makes the resulting oil virtually worthless for any purpose except for fuel. For this reason the great problem before the oil shale industry in England is a method of removing this sulphur from the shale during the process of retorting, or from the crude oil, without spoiling the oil. Until this technical problem is solved, the oil shale deposits of England are commercially worthless.

Scotland

The Scottish Oils, Ltd., is a consolidation of the six original Scottish oil-shale companies—the Oakbank Oil Company, Ltd.; the Pumpherston Oil Company, Ltd.; The Broxburn Oil Works, Ltd.; Young's Paraffin Light & Mineral Oil Works, Ltd.; James Ross & Co., Philiptown Oil Works, Ltd.; and the Dalmeny Oil Company, Ltd. The capital stock of Scottish Oils consists of 4,000,000 shares (par value £1=$5) divided into 1,000,000 ordinary (common) shares and 3,000,000 preference (preferred) 7 per cent non-cumulative shares.

The Anglo-Persian Oil, Ltd., controlled by the British Government, has acquired a controlling interest in Scottish Oils, Ltd., and has agreed to furnish from January 1, 1923, supplies of crude petroleum in such quantity as may be needed, in addition to the crude shale oil produced, to keep the present refineries of Scottish Oils running at full capacity. Of the six constituent companies in Scotland Oils the Broxburns and Youngs are engaged in mining, retorting, refining, candle making, and the manufacture of sulphuric acid; Oakbank and Phumpherston are engaged in mining, retorting and refining. James Ross & Co. and Dalmeny are limited to mining and retorting.

In 1919 the total production of crude shale was 2,758,555 long tons.

In giving the American equivalent for English money $5 has been assumed to be the equivalent to the English pound sterling. In order to get the exact value the prevailing rate of exchange should be considered.

Average yield of crude	1915	1916	1917	1918
oil in gallons	20	20	20	20
Ammonium sulphate in lbs.	44	44	40	40

Dividends Paid

	1914 1915 Per Cent	1915 1916 Per Cent	1916 1917 Per Cent	1917 1918 Per Cent	1918 1919 Per Cent	1919 1920 Per Cent
Pumpherston						
First preference	6	6	6	6	6	6
Second preference	6	6	..	..	..	..
Ordinary	10	25	40	40	40	30
Oakbank						
Preference	6	6	6	6	6	6
Ordinary	..	10	15	15	15	10
Broxburn						
Preference	6	6	6	6	6	6
Ordinary	..	7.5	15	15	15	12.5
Youngs						
Ordinary	..	..	5	6	6	2.5

On February 10, 1920, the Scottish Oils, Ltd.—the consolidation of all the Scottish Oil shale plants—paid a semi-annual dividend of 3.5 per cent on its preference shares.

Mining

At the Westwood pit of the Oakbank Company shale is now being mined from the Middle Dunnet seam at a depth of 640 ft. Upper seams were worked from a shaft now abandoned. One large fault with a throw of 300 ft. and many small faults have been found. A vertical shaft was opened four years ago, after numer-

Statistics for 1915, 1916, 1917 and 1918

Employees	1915	1916	1917	1918
Underground	3,856	3,821	4,825	4,153
Above ground	702	702	742	767
	4,558	4,523	5,324	4,920
Total production—long tons	2,992,676	3,009,232	3,116,529	3,000,317
Average price received per ton	$1.39	$1.71	$2.05	$2.47
Total value of annual product	$4,176,000	$5,161,470	$6,395,000	$7,640,390

ous bore holes had been put down, the exact location of the deposit determined, and a complete plan of development mapped out. The main shaft is circular, 16 ft. in diameter, double compartment, brick walled 14 in. thick. Double cages are used, with room for two cars on each deck. From the bottom of the shaft four main drifts are run, each 12 ft. wide, 12 ft. high, bricked on both sides and roof. The working faces are 1,680 ft. from the shaft. The main drifts are large, well ventilated, and lighted by electricity. The seam of shale now being mined is 12 ft. thick, on an average, and dips at an angle of 18 deg. The roof and floor are good; very little timbering is necessary. Cars of shale are drawn by electricity from near the face of the workings to the main drifts, then by gravity to the shaft, and back to the working faces. This entire plan for moving the shale from the working face to the surface is particularly efficient and economical and was worked out carefully before the shaft was sunk. The daily production is 640 long tons. The mine is so free from gas that open lamps are used. The mined shale goes in freight cars to the retorting works at Oakbank. The method used in mining at the Westwood pit is the room and pillar, and retreating system. The main drifts are driven and pillars 120 ft. square are left. During this stage of operation from 15 to 20 per cent of the shale is taken out. The extreme boundaries of the ground to be mined through this shaft are previously determined. When these boundaries are reached the retreating system is followed and the blocks are taken out. Each of the blocks—120 ft. square—is divided by cross cuts into four small blocks; these are then taken out in order.

The loss in mining is approximately 10 per cent.

Gas, Gas Explosions and Accidents

No serious gas explosion has ever occurred in any Scottish shale mine. Large gas explosions and fires are virtually unknown. The laws governing the operation of coal mines apply to shale mines and the same care, method of ventilation, and the safety of workmen that prevail in coal mines are enforced in shale mines. A fireman makes the rounds every morning watching for fire damp. Reports of the conditions of the mine are kept and are inspected regularly by Government officials. No gas is ever found in the new workings. Marsh gas (CH_4) is sometimes found in small pockets in old workings. Protection is given by handing up an open lamp. Occasionally a small fire may occur in one of these old workings and a miner may be slightly burned, but the fire is always local and easily extinguished. Such gas explosions and fires as have occurred in this country where an entire coal mine has been on fire and completely ruined have never occurred in shale mines of Scotland during their 70 years of working. Fatal accidents are also rare. In the past three years only one man has been killed in the Westwood pit. He was killed by the fall of shale at the face.

In the past twelve years at the Mid Breich pit of the Pumpherston Company only three deaths have resulted from accidents.

1. A man was killed by the fall of shale at the face. 2. A careless boy was wound round the drum of an engine. 3. A careless boy fell under the wheels of an ore car.

During these twelve years only one man was burned by gas.

Hours, Wages, Protection

At the Westwood pit mining is done in three shifts of seven hours each, from 7 A. M. to 2 P. M., from 3 to 10 P. M., and from 11 P. M. to 6 A. M. All mining is done on the contract or leasing plan. One man is given a block of ground to work, i. e., a lease. He hires his own men, provides all tools, powder, and supplies of all kinds, mines the shale, puts it in the cars, and delivers it to the nearest main haulway. The company then hauls it to the surface. For this the lessee receives from the company four shillings and seven pence or $1.14 a ton. The minimum wages guaranteed to each miner is $3.12, the pre-war rate, plus $1.25, the war bonus, or $4.37. If for any reason, beyond his control, like a thinning of the seam of shale or encountering a fault, his production at $1.14 a ton yields him less than $4.37 a day, the company makes up the difference. If, however, he can increase his production he is at liberty to increase his daily wage as much above the minimum as he pleases. The average amount of shale mined per day per man is 4.25 tons, i. e., one miner and one man for mucking and tramming will on the average, mine 9.5 tons a day; two miners and one trammer will product 14.25 tons a day. Throughout the shale mines of Scotland the practice is to mine the shale with hand augers, first with a 1.75 in, and then with a 1.5 in. auger. Black powder is used. The law does not allow an intoxicated man to work and forbids the sale of liquor about a coal or shale mine. Shale miners regard themselves as being on a higher plane than coal miners. They are a self-respecting class, generally married, live in company houses, "dress up" when not working, and generally maintain a good method of living. The methods, wages and features of the Westwood pit of the Oakbank Company are characteristic of all the shale mines in Scotland.

The Shale Oil Strata

The oil shale deposits of Scotland consist of twenty-one different strata. The yield of oil and ammonium sulphate varies greatly in these different seams, in the same seam at different localities; and also with the depth of the various seams, e. g., the Torbanehill Mineral, the highest in the series, has given the greatest yield of oil, 130 gal. to the ton, but only a few pounds of ammonium sulphate. In the succeeding strata a diminution of oil and an increase of ammonium sulphate is noticed till at the lowest stratum, Pumpherston No. 5, the oil yield is only 20 gal. to the ton, but the ammonium sulphate has risen to 60 lb. to the ton. Also, the Raeburn stratum was best developed in a very small area in the southwestern part; the Fells stratum was best developed in the western part where other strata gave less oil; the Broxburn stratum is best at Broxburn; the best part of the Dunnet stratum is in the eastern part of the area.

The following tests of Broxburn shale show the gradual decrease in oil content and gradual increase of ammonium sulphate as depth is reached:

		Near							Greatest
Vertical depth in feet.....	Outcrop	Outcrop	438	821	912	...	965	1.077	Depth
Gallons of crude oil.....	31.8	29.6	30.7	24.1	25.8	24.8	22.5	17.3	13.5
Ammonium sulphate—pounds	9.3	10.5	10.4	15.4	11.6	13.4	9.0	16.6	17.1

Thus, in a depth of approximately 1,200 ft. the oil content has decreased from 31.8 to 13.5 gal., but the ammonium sulphate produced has risen from 9.3 to 17.1 pounds.

The Origin and Nature of Kerogen

Prof. Crum Brown, F. R. S., was the first to give the name "kerogen" to the "carbonaceous matter in shale that gives rise to crude oil in distillation." The exact nature of kerogen and its origin is a matter of controversy among scientific men. The practical bearing of a solution lies in this: If the exact nature of kerogen can be determined, this knowledge may have a practical bearing on the best method of destructive distillation. If the nature of kerogen can be so determined that it is a foregone conclusion that in the destructive distillation a large amount of unsaturated hydrocarbons (80 to 90 per cent) will always be formed, then it is a useless task to seek for a retort that will produce only 20 per cent. If, however, the kerogen is shown to be of such a nature that a large production of unsaturated hydrocarbons is due to unscientific methods of distillation, and not to the nature of the kerogen itself, then the successful treatment of shale would not be accomplished until a retort was constructed on such lines as would yield crude oil which contained the minimum amount of unsaturated hydrocarbons.

Organic Theory

In true oil shale there is no crude oil. A very small amount of oil may be obtained by such solvents as carbon disulphide, but the amount is so small as to be negligible in determining the nature of the oil shale itself. Since carbon and hydrogen compounds produced by inorganic reactions are soluble in carbon disulphide, ether, or similar solvents, it seems very probable that kerogen, the source of the oil in shale, since it does not yield to the usual solvents, must be of organic origin. The organic theory of the origin of kerogen assumes that the contents of a shale stratum were laid down in lake bottoms, lagoons, or estuaries of the ocean, i. e., fairly quiet waters. By the denudation of the land the clay and sand would be deposited along with the remains of vegetable life from the land and animal life from the water. The very large amount of fossil remains found in the oil shale supports this theory.

The Inspissation Theory

E. H. Cunningham-Craig takes exception to the organic theory. He is a geologist of world-wide experience, has investigated the nature of kerogen by a microscopic study of thin sections, and has correlated oil shale strata with coal seams and petroleum deposits in all parts of the world. His arguments are chiefly geological. His conclusion is that an oil shale stratum should be regarded as the remains of a former oil field; that oil shale fields and oil fields are not two phenomena entirely unrelated but are closely associated in origin and development; that kerogen is "not the mother but the daughter of petroleum." American scientific men and D. R. Stuart, the Scottish authority on oil shales, generally favor the organic theory, but the wide geological observations of Cunningham-Craig and his keen analytical powers demand careful consideration of any theory he may propound. The whole question is one of supreme practical importance, and much additional observation and research are necessary before the nature and origin of kerogen can be regarded as accurately determined.

Retorting

The Scotch retort now in use is a double-chambered vertical retort designed not to produce the maximum amount of crude oil, with ammonium sulphate as a secondary consideration, but for the purpose of securing the maximum yield of ammonium sulphate, with the yield of oil a secondary consideration. Since most of the American oil shale, thus far tested, gives a high yield of oil and a comparatively small amount of ammonium sulphate, the present Scotch retort cannot be advantageously copied, in toto, with a reasonable expectation of satisfactory commercial success. The older Scotch Henderson retort which was designed primarily for the production of oil is more likely to meet the conditions of American shale than the present type. This type, with modification, or some form of a horizontal retort, not yet perfected, is most likely to be successful on our American shales.

The present Scotch retort is composed of two chambers, one above the other. The upper chamber is made of cast iron, eleven feet high, two feet in diameter at the top and widened to two feet four inches at the bottom, so that the shale may drop down without clogging. The lower chamber is twenty feet high enlarged at the bottom to three feet in diameter. Shale is fed in at the top from a hopper and descends gradually by gravitation through the retort and is removed as spent shale at the bottom. Heat is applied around the retort from the incondensible gases produced by the retorting. Generally enough gas is produced from the shale itself, but when lean shale is being retorted, the amount of gas is insufficient. At such times an auxiliary coal fired gas producer is used to supply the necessary amount of gas. The gas enters at the bottom and is forced to circulate around the retort. Into the lower chamber exhaust steam is injected and a temperature of about 1,800 deg. Fahr. is maintained. Here the ammonia is formed by the combination of the steam and the nitrogen of the shale. The oil and gas are formed in the upper or cast iron chamber at a temperature of about 900 deg. Fahr. Thus the raw shale enters at the top, is subjected to a heat of 900 deg. Fahr.; oil and gas are formed; the shale then drops gradually down through the retort; in the lower chamber it meets the incoming steam, it is subjected to a heat of 1,800 deg. Fahr. and ammonia is formed. The entire product, consisting of ammonia, water vapor, oil, and gas sweep upward through the retort and pass out through a large pipe to the condensers. Here the permanent gas is drawn off and goes to the scrubbing tower. The crude oil and water, containing ammonia, flow into separator tanks where, by the difference of their specific gravity, the oil

and water assume different levels and can be drawn off separately for further treatment. These retorts are erected in groups of four: a series of these groups forms a bench. The daily (24-hour) capacity of a retort varies from two to four tons of shale. The time required for the passage of shale varies with the amount of oil produced. The richer the shale the longer the time required; poorer shale is retorted in less time. No basic changes have been made, during the past twenty-five years, in the type of retort now in use. Improvements made have been of a mechanical nature in connection with the feed and the discharge, and in the change of the horizontal section of the retort from a circular form to an elliptical or rectangular form.

Refining

The products of retorting and condensation are as follows:

(a) Gas.—Permanent gas is drawn to the tower to be scrubbed and then returned to the retorts to be burned in heating retorts and retorting more shale. In the scrubbing process in the tower, crude naphtha is obtained. This is treated with acid and soda and distilled to get motor spirits and finished naphtha, both ready for the market.

(b) Crude Oil and Ammoniacal Liquor.—These go from the condenser first to the receiving tanks and settled—crude oil (c) at the top and ammoniacal liquor (d) at the bottom.

(c) Crude Oil in the Receiving Tanks.—This goes to the refinery and in the first stage is distilled to get green oil (e).

(d) Ammoniacal Liquor.—This is distilled and put through sulphuric acid boxes to get the mother liquor; this is concentrated to get the ammonium sulphate, ready for the market.

(e) Green Oil.—This, in the second stage, is distilled and gives:

(f) A little naphtha,
(g) Crude burning oil,
(h) Heavy oil containing paraffin.

(h) Heavy Oil Containing Paraffin.—This is frozen and pressed to get blue oil (i) and crude paraffin (j).

(i) Blue Oil.—This is treated with acid and soda and distilled. The distillate is fractionated into gas oil, medium oil, and lubricating oil. The gas oil is ready for the market.

The medium and lubricating oils are treated with acid and soda, settled, and are ready for the market.

g) Crude Burning Oil.—This is treated with acid and soda and distilled, and gives as finished products ready for the markett:

1. Power oil for internal combustion engines (gasoline, petrol).
2. Lamp oil.
3. Lighthouse oil.

(j) Crude Paraffin.—This is run on the top of water in pans and cooled. The water runs off leaving the paraffin. The doors of the sweating house are closed and the heat turned on. The gentle heat sweats off the excess of oil out of the paraffin. The melted paraffin wax from the sweating house is mixed with charcoal and put through the filter press. The charcoal is separated from the paraffin. The paraffin is then put into tins for the form and size becomes a finished product ready for the market. The Henderson sweating system has been used, without material change, for the past thirty years.

The residues from the feed boilers (stills) go to the coking stills and run to dryness. Coke is left. The heavy portions of the distillates, besides coke, are sent to the proper part of the plant. The coke is sold to the aluminum works, is used for fuel in smelting works, or as carbons for lighting purposes. It has less than 1 per cent of volatile matter.

Tars from the acid washings are neutralized with tars from the soda washings and the neutralized tars are burned in the furnaces.

All residues are sent to their proper places in the plant. The acid and soda treatments take out the unsaturated hydrocarbons and unstable bodies and improve the color. There is a good market for all the products. The refining loss is approximately 25 per cent.

General Observations

Very little has been published about the Scottish oil-shale industry in recent years; little that is new has been developed; standard practice has been adopted and followed: the criterion has been the declaration of dividends; the scientific side has not been studied to any great extent; the early days were the days ot rich shale: the Henderson retort was designed to treat these rich shales—30 gal. or more. This retort was discarded, the present double-chambered retort adopted, and shale yielding less oil was treated, not because deposits of richer shale were exhausted, but because the leaner shale was easier to retort, gave a crude oil that was easier to refine, produced better commercial products, and contained more nitrogen and, consequently, more ammonium sulphate. Thus the leaner grade of shale gave better commercial and financial results, i. e., made more money. Ammonium sulphate now brings £22 ($110 normal exchange) a ton at the works for home consumption; for export it brings £56. It is used largely by the sugar-beet and cane-sugar growers.

The methods used in the Scottish laboratories to determine the oil and nitrogen content are simple but check closely with large scale results.

Oil Content.—Two pounds of broken shale are placed in an iron tube, sealed at one end, seven feet long and two inches in diameter. The sealed end is pushed gradually into an oven. The gas and oil vapors, coming out of the tube, are simply caught, weighed and measured, roughly.

Nitrogen Content.—An iron tube three feet long and one inch in diameter is filled with raw shale and placed in an oven. Heat is applied slowly and steam is injected. Vapors are drawn off and sulphuric acid is added to get the ammonium sulphate.

The purpose of the Anglo-Persian Company, in acquiring the oil shale properties in Scotland was, apparently, to secure the extensive and well-developed organization, i. e., the refineries, the trade marks, the distributing machinery, customers, technical men, skilled workmen, and the market.

The Oil Shale of England

The oil shales of England occur as well marked strata in the formation known as the Kimmeridge clay. This formation takes its name from the little village of Kimmeridge, in the south of England, two miles from the coast line of the English Channel, near which the formation outcrops and where it was first studied. The formation, about 900 ft. thick, has been determined by bore holes and outcrops over a large area of England, viz.,

in Dorset, Kent, Sussex, Yorkshire, Lincolnshire, Norfolk, Cambridgeshire, Buchinghamshire, and Wiltshire. The formation is not continuous, but has been eroded in many places before the overlying upper cretaceous rocks were deposited. The oil shale strata occur as basins in the upper division of the formation, notably in Dorset, Norfolk, Lincolnshire, and Yorkshire.

The Oil Shales of Dorset

The oil shales at Dorset have been known for many years. The Kimmeridge "Coal Money" was made from the oil shale and was used as currency in very early days, even before the Roman occupation of Britain. Later the shale was used as fuel by the inhabitants of the region. It lies about 300 ft. below the top of the Kimmeridge formation. The first commercial effort to utilize these shales was made in 1848 by the Bituminous Shales Company. The company continued in business for six years, but ultimately failed. Six successive attempts were made up to 1879 to utilize these shales commercially, but each failed, chiefly because of the large sulphur content.

The outcropping of the Kimmeridge shale forms a notable feature of the England Cliffs on the English Channel for several miles east and west of Kimmeridge Bay in a well-defined anticlinal, with some minor faults. The oil shale appears in two well-marked strata—the Blackstone and Main Bed.

Complete Analyses

	Kimmeridge Blackstone	Corton Main Bed
Carbon	37.94	26.75
Hydrogen	4.19	3.67
Nitrogen	1.03	0.57
Sulphur	4.51	5.57
Oxygen (by difference)	3.88	2.79
Ash	48.45	60.65
	100.00	100.00

The specific gravity of the shale from the Kimmeridge was 1.775; from the Corton, 1.645, at 15.5 deg. Cent. The old shaft, tunnel, and bore holes near Kimmeridge have long been abandoned. The present workings are at Corton, near Weymouth in an outcrop of the Blackstone seam. Six adits 1,000 ft. apart are being driven. Four are each 350 ft. long and two 60 ft. long. Here the Blackstone seam consists of two strata—3 ft. and 2 ft. 6 in. thick, with a clay stratum 2 ft. thick between.

The Oil Shales of Norfolk

The Kimmeridge clay formation in Norfolk County has been well explored by open cuts, bore holes, and shafts, in the region south of King's Lynn and east of the Ouse. The oil shale appears in two series, the upper, called the Smith's Series, and the lower, the Puny Drain Series, virtually at the top of the Kimmeridge clay. An open cut or quarry on the property of the English Oilfields, Ltd., shows a seven-foot stratum of oil shale, wet and oily, beneath an overburden of from 13 to 30 ft. in thickness. The dip is 5 deg. to the east. The deposit has been tested by pits and bore holes over an area of two square miles. A 50-ft. shaft, 6 by 12 ft., has been sunk to an 8-ft. stratum of oil shale. This stratum consists of two distinct layers; the upper, or black shale, 3 ft. 6 in. thick; and a lower stratum, 4 ft. 6 in. thick. The roof is soft so that the walls and roof of the main drifts need to be bricked.

English Oilfields, Ltd.

The English Oilfields, Ltd., is the largest oil-shale company in the Norfolk district. It owns, or controls by long lease, sixty square miles of territory. It is capitalized at £1,500,000 ($7,500,000) in shares of one pound sterling each. The company is making extensive improvements on their property consisting of a branch from the main line of the Great Eastern Railway to their property, houses for workmen, retorts, condensers, scrubbers, refinery shops, and by-product plant, with the intention of establishing a plant complete in all details. Besides it has erected and tested several retorts for the distillation of its shale.

The Removal of Sulphur from Oil Shale

Fortunately for the oil-shale industry in the United States, sulphur in the oil shale here has not yet been found in quantity to be detrimental to the oil produced. Also there is little or no sulphur in the Scottish shale. But in England the known beds of oil shale all carry so much sulphur as to make the oil unmarketable except for fuel. During the war the British Admiralty raised the allowable limit of sulphur in oil to three per cent. but paid a low price for any above two per cent. The one great obstacle standing in the way of the development of the oil shale industry in England is the desulphurization of the shale without spoiling the oil. Logically there are three methods of attack.

(a) During the retorting of the shale an attempt may be made to remove the sulphur by such agents as lime and caustic soda.

(b) As soon as the oil vapors and gas are evolved, and before condensation, they may be passed over desulphurizing agents.

(c) After the vapors have been condensed the oil may be desulphurized by some chemical means.

Many patents have been taken out to cover processes and many individuals claim to have a solution, yet no process has yet appeared that satisfies commercial and industrial requirements. During the great war the need of a domestic supply of oil was felt so keenly by the British Government that it investigated every possible source of supply. In the case of oil shale the presence of an excess of sulphur stood as an insurmountable obstacle. It remains the great unsolved problem before the technical men of Great Britain. When its solution comes, as it probably will some day, great quantities of oil shale in the Kimmeridge formation now commercially valueless will become a source of great wealth to the British Empire and of economic importance in supplying an additional domestic supply of oil.

Besides the technical point of view, it is to be observed that in a utilitarian age like the present, the aesthetic objection to the odor of sulphur bearing oil may have to be ignored because of grim industrial necessity. Also sulphur-bearing oils may have to be mixed with non-sulphur-bearing oils to reduce the average percentage of sulphur below the objectionable point. However, the only solution that will be permanently satisfactory will be the production of sulphur-free oil.

Sulphur occurs in shale oil and petroleum in the form of organic and inorganic compounds and even as free

sulphur dissolved in the oil. The sulphur in inorganic compounds may usually be removed without much difficulty, either in the process of distillation, or by treatment of the distillate. Some organic compounds of sulphur are more or less decomposed by distillation, so that a partial removal of the sulphur is easily effected, but the complete elimination of organic sulphur from an oil may prove very difficult commercially, and, in fact, a perfectly satisfactory solution of the problem has probably not yet been found. The exact conditions or combinations in which the sulphur exists, which are not definitely known, and which may vary in different oils, add to the difficulties of the case. Many methods have been proposed for the elimination of sulphur and some have proved successful with certain oils. Unsaturated organic compounds containing sulphur can be removed with sulphuric acid, but ordinary sulphur-free unsaturated compounds are more easily attacked, and, therefore, if the oil contains a large percentage of the latter, the process becomes too expensive. Also, it is possible for sulphur to be actually added in the process, by the formation of sulphonic acids. Liquid sulphurous acid has been used in the Edeleanu process to remove sulphur. It combines with the unsaturated sulphur compounds and settles out of the oil. But not all the sulphur is necessarily in combination with unsaturated compounds. Metallic oxides, such as cupric oxide, have been employed to combine with the eliminate sulphur. This is done, either by bringing the hot vapors of distillation in contact with the oxide, or agitation of the latter with the hot oil. The above and other methods are employed with more or less success according to the nature of the oil, but the problem as a whole is apparently still unsolved. Among the forms in which sulphur has been found in shale oil or petroleum may be mentioned free sulphur, hydrogen sulphide, thiophanes, alkyl sulphides, mercaptans (in Baku oil), carbon disulphide, algyl compounds of carbon disulphide.

Investigations by the British Government

On account of the shortage of petroleum and its products during the great war, especially fuel oil for the Admiralty, the British Government directed its attention to the possible production of petroleum from home supplies, i. e., from Scotland and England alone. First of all, efforts were made to increase production from the known deposits of oil shale in Scotland by speeding up the mining of the raw shale, by using to full capacity the retorts in use, and by putting in use older retorts that had been lying idle. By these efforts the output was increased but not to a degree sufficient to meet the pressing needs.

Investigations were then carried on with the deposits of oil shale which were known to exist in Dorsetshire, Norfolk and elsewhere, but on investigation these shales were found to produce an oil too high in sulphur for Admiralty purposes and various retorts and processes were tried in order to produce a suitable oil from these shales and an oil which was free from sulphur. In 1917 the Inter-Department Committee carried out experiments with the Del Monte retort, a low-temperature distillation process, on the Kimmeridge shales which gave an output of 45 gal. a ton, but carried 6.67 percent of sulphur. An endeavor was then made to find a process for eliminating this sulphur and from June to October, 1917, experiments were carried on and investigated by a process invented by Heyl which failed to produce the results obtained by the inventor. Other processes examined were Burnet's process for desulphurizing the oil obtained from the Norfolk shales. Still other processes investigated were Tozer's system for producing oil by low temperature, vacuum process distillation, the S. O. S. system for the retorting of sewage sludge, the Simpson system, the Moeller system, the Maclaurin system, and the Lamplough process. Oil shales from other parts of the country were also investigated, namely, at Anglesey, Skipton in Yorkshire, and other places. Having failed to find any satisfactory process for eliminating this sulphur, attention was directed to the cannel coal and Torbanehill which were known to exist in various parts of the country, and which were capable of producing a high percentage of oil.

General Observations

The English oil shale deposits are essentially different from those investigated elsewhere and present specialized problems of desulphurization, retorting, and refining. They are particularly characterized by:

(a) A high specific gravity.

(b) A large amount of olefines and unsaturated hydrocarbons.

(c) A low content of the paraffin and naphthlenic series.

(d) A high percentage of sulphur.

To those who foresee a high price for the ammonium sulphate produced from shale a note of warning should be sounded. The high price of ammonium sulphate obtainable in Scotland is the result of peculiar local and industrial conditions and should not be regarded as a criterion for the United States. Here the synthetic production of ammonium sulphate has progressed to such a point that its market price in the future will be lower than it has been in the past, so that a high price for ammonium sulphate, as a product from crude shale oil, should not be counted upon.

Good oil shales have low specific gravities. The specific gravity of ordinary clay shale varies from 2.4 to 2.5. The specific gravity of oil shale is seldom more than 2.2 and may go as low as 1.5. As a general rule the lower the specific gravity the richer the oil content.

The Use of Steam—Advantages

1. Increase in the value of the oil.
   (A practical observation in Scotland.)
2. Dilution of the oil and gas vapors.
3. Increase in the velocity of the discharge.
4. Oil and gas vapors are swept away from the hot zone and secondary decomposition reduced.
5. Increase in the paraffin products.
   (A practical observation in Scotland.)
6. Equalizes the temperature.

In the opinion of the Scotch operators exhaust steam should always be used. This is based upon years of practical experience rather than theoretical consideration.

(*Continued on page* 265.)

No Single Expedient Will Solve Fuel Problem

Industry's Opportunity for Widening Use of Gas Is Vast—Some Means Toward Such an End

By L. W. ALWYN-SCHMIDT

There cannot be any doubt about the desirability of employing gas as a fuel for industrial purposes in preference to coal. But opinion differs greatly as to the form of applying gas to the purpose of providing industrial energy. There are those who hold that only the gas motor can solve the problem, while others merely desire to see gas applied as a fuel. Over the dispute about the advantages and disadvantages of either system progress in both directions is halted. It is, therefore, time that a truce be called between the contending parties and the rights and wrongs of each case be inquired into.

No kind of progress has ever been made in this world by revolution. Revolution is as foreign to the economic household of the world as it is to all other forms of life. A common domestic cat cannot be turned into a Persian from to-day to to-morrow, but there is a possibility of improving the breed step by step until it has reached an appearance very much like the Persian cat. So you cannot take this world of ours, with its mixture of steam, electricity, gas, water, wind and other energy producers, and turn it into one where gas reigns supreme. The development has to come about gradually, and those who desire such a development must apply their guiding hand at all those points where guidance promises the best result. If we desire real progress it must come about by way of an evolution that makes use of the existing facilities, adjusting them to the new forms of heating and power production. In such a scheme of evolution there is, however, no room for arbitrary measures; no hard-and-fast rule can be applied. What is wanted is a common purpose.

Generally speaking, the gas motor has not been exactly the success it deserves to be. It would be wrong to blame the gas industry for the failings of the engine, but there is no denying that the builders of the gas motor have let slip a great opportunity. The principal disadvantage of the gas motor in its present form is its size. Practically all gas motors which are employed industrially are comparatively high-powered machines, destined for the use of a centrally located power source with a transmission gear leading to the various points of power consumption. The appearance of the electric motor, with its small power development, and the internal combustion engine of the gasoline type has shown the enormous advantages of employing individual motors in most industrial plants, and the gas engine has failed to follow the lead given by these two newcomers. It is difficult to see how this mistake, once made, could be corrected at so late a date.

Small Power Motors Wanted

The electrical motor and the internal combustion engine have made much headway, and there are advantages connected with the use of either that make it doubtful whether manufacturers will be inclined to return to the use of small individual gas motors even if the gas engineers would be willing to supply such a motor. If, nevertheless, the construction of a small gas motor is now recommended, this has its reason in a new development of the use of gas that has not yet found full attention in our own country. It has been argued that the use of gas fuel is impractical in many cases, because it is difficult to supply gas to the points where it may be most required. This concerns especially the rural districts. But we are taking generally an entirely wrong attitude when discussing the problems of the gas industry. Having once become accustomed to speak of the gas industry only from its aspect of the community gas plant, we have omitted to take notice of the fact that the gas industry in reality has a field of application much in excess of the generation station in its present form. Successful experiments have shown that gas can very well be made of many other materials than coal. In Canada straw has been used for gas making and wood in Germany.

The gas industry would be wrong if it were not to use this opportunity for widening the application of gas, especially as there are great possibilities for such a development in the United States. We see, therefore, ahead of us the growth of a branch of the gas industry, building small gas plants for burning farm refuse of all kinds suitable for gas making and employing the gas gained in this way for the operation of small gas engines or for heating. The importance of such a development for our rural life and for the national household in general is very great. Much of the oil consumed in the United States is burned to-day upon the farms. It costs much money to distribute this oil, and whatever may be said in favor of the oil stove and oil lamp it cannot measure up to the gas range or electric light where this can be obtained. In addition, materials are turned to valuable use which have been thrown away in the past. To make full use of this extension of the activities of the gas industry small gas motors are required. These may be employed either for the direct application of power or it may be possible to use them also as a generator for electricity.

In either case it is essential that the motor should not exceed the power requirements of the farmer or whoever uses it, which necessitates a selection of low-powered motors that should compete with the electrical and internal combustion engines put upon the market. It will be seen that the lack of such motors is to-day a direct impediment in the way of installing individual gas plants in such establishments. The plan can work only if the farmer has in hand a motor that works very economically.

Construction of Small Individual Gas Plants of Economic Importance

But the possibilities of these individual stations are not exhausted with the construction of small-power gas engines. The power generated in this manner may be turned into electrical lighting, and this form of use may appeal more to the consumer. But it will be more advantageous to him to cook with gas. One can hardly imagine what cooking with gas will mean to the farmhouse of to-day.

It will simplify farmwork to an extent not known yet, and if the gas industry offers the possibilities for such an improvement of farm operation it will do more for the back-to-the-land movement than has been accomplished by any other agency. Every form of back-to-the-land campaign breaks down to-day on the obstacle that the farm does not offer the advantages of life which are offered by the city. The city dweller has in reach all the improvements of modern existence which are withheld from the farm dweller. Hence the desire to move to places where these advantages can be had. Here is a market for the gas industry that has not been tapped yet but which waits for development.

Similarly, gas engines of small power development might be installed in private houses, office buildings or large apartment houses for the production of electrical energy to be used in the buildings. This also is a point that has not found full consideration. The question is rather one of economic expediencey than of technical practicability. Under the present system of heating, gas seems to be more essential to most houses than electricity; at least, it seems that gas can fill both the heating and lighting requirements, while electricity is still somewhat behind as to its heating application. If gas has to be carried to the houses it might as well be used for the operation of small engines, as is the case already to-day in many office buildings which produce their power by aid of a gas engine and convert it into electricity.

But granting even these very considerable opportunities for the gas engine, there remains the fact that it would be uneconomical to-day to replace the existing steam power equipment with heavy gas engines in the purely industrial enterprises. An exception is formed by the electrical central stations.

The case of the electrical central station has been discussed already so often that it almost means carrying coal to Newcastle to return again to it. Nevertheless, if it is taken up again the excuse is its enormous importance for the future households of the nation. If one considers that the consumption of coal by such public utilities as the New York Subway and the New York electric central station exceeds many millions of dollars annually, and that all this coal is burned without the slightest attempt at saving the by-products, one will readily see that our public utilities are wasting unrecoverable riches. If one further considers that all this waste could be removed with one sweep by simply replacing the boilers and furnaces with giant gas motors or gas heaters, and let gas be the power base instead of coal, there is no excuse for this condition continuing even a day longer. But the gas industry cannot let the first move come from the public utilities; it must make that move itself by constructing super gas engines that will do the work now performed by the furnaces and boilers. These machines will most likely follow in their development the evolution of the internal combustion engines of the Diesel type, which have now grown to very considerable power developments.

Super Gas Engines Wanted for Central Power Stations

It seems, therefore, that the future of the gas engine as an aid to spread gas consumption does not lie in the direction of the medium-type engine of to-day, built for the use of the industrial establishment, but rather in the construction of either low powered or very high-powered engines, the one to be used in individual power plants of comparatively low-power development in connection with private gas generators, the other for the use of the large central stations to replace steam power equipment in use at the present time.

We all expect, of course, in time a complete centralization of all power development in all such regions where this is feasible. This development most likely will be brought about by use of water power and central gas plants, located in proximity to the coal mines, supplying gas to super electrical stations. But during the transition period, while there are still large private steam power systems in operation, steps must be taken to supply these private centrals with the required fuel.

The immediate replacement of these private steam power houses with gas engines does not seem practicable, because the cost would be too high. In fact, such a method of procedure would really hinder the centralization of power development, which is generally held to be the most desirable aim. But it is absolutely necessary to relieve these power plants early from the necessity of having to burn coal, which will be done by the installation of gas-heating systems.

The industrial use of gas has made quite enormous progress during the last few years, and nearly all gas works report a very considerable increase in the industrial gas consumption of their particular distribution field. This development has not come about by mere chance, but is the logical outcome of the present situation. The tendency, once established, has been followed up intelligently by gas men and the so-called industrial gas consumption field has been carefully husbanded. The great success that accompanies this work wherever it is attempted shows that the demand for gas for industrial consumers is really very great and that the industrial consumer welcomes the aid given him in this respect by the gas-producing industries.

Outside the burning of gas as a fuel for gas power engines, gas may be used industrially to-day in various ways. It is applied either directly or indirectly. Under direct application may be understood such uses of gas where it is employed for welding, for drying, heating or for any other kind of work where gas is drawn directly from the outlet for the special work on hand. It is this kind of gas employment that has found mostly the attention of the gas industry at the present time, possibly because it could be easiest explained and also because of the very

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As the Journal Views It

The Gas Man's Attitude Toward Municipal Ownership

Manufacturing, selling and distributing gas to the average community at the present time is neither a profitable nor altogether agreeable task. Not only is financial support tardy and reluctant in coming from an apparently apathetic public, but even moral support in the way of appreciation for the real effort that is being made to keep the works going despite seemingly hopeless obstacles that stand in the way.

It is but natural that the gas man, when municipal ownership is mentioned, should grin and express willingness to "let them have it." Under the circumstances the joke assuredly would be on the benighted politician, who in his ignorance might lead his constituents into a business now so perilously balanced that the slightest lack of skill in handling might easily bring on utter demoralization.

But the average gas man knows full well the consequences of municipal ownership of the gas undertaking; knows what it involves to the public.

Therefore to passively permit such a contingency to come about; to cynically view the whole proposition as one akin to passing a white elephant over onto the shoulders of another, cannot be viewed as anything less than a flagrant dereliction of a public duty.

The gas man is essentially a public servant. As such, whether the public appreciates or not, he is morally bound to combat with full force and vigor any and all agitation seeking to impose upon the public a responsibility that will be ruinously costly for it to assume.

Reviving Optimism

Of recent times it has not been an especially inspiring task to be a toiler in the gas industry.

Most industries have experienced some anxieties, worries and perplexities, but to the harassed gas man it has seemed that his industry has had them all.

It seems that a treadmill spirit had seized the whole gas industry. It was simply a case of strug gling on until even struggling would not achieve an existence.

But we see here and there a gleam of new interest. People begin to talk of new business and bigger things

Is it merely a case of the occasional gleam of sunshine in a clouded sky, or does it presage better times—times in which we may at least entertain hopes—for the gas industry?

No Single Expedient Will Solve Fuel Problem

(*Continued from page 262.*)

great advantages that gas offers to the consumer when used in this manner. But while our gas works have added much to the gas turnover by attracting this form of industrial consumption, the actual gas required for these purposes must be small in comparison to the enormous quantities of gas that might be sold if it could be employed directly as a power producer in replacement of coal under the boilers of the American industry.

Waste of Present Industrial Heating System Staggering

During the year 1914 the total consumption of coal and coke in the American industry amounted to 212,000,000 tons, and 285,000,000 cu. ft. of gas were sold in addition to the industrial consumer. The moving of these enormous quantities of coal from the coal yards to the consumer is costing the nation at least $200,000,000, and the loss of by-product values is absolutely staggering considering that the total industrial fuel expenditure and that for power amounted to $666,000,000 during the same year.

Here lie millions and millions of undeveloped dollars that might come to the gas industry, and the time was never more favorable for the attempt to direct their flow in the direction of the gas works.

But before this attempt can be made the question must be solved as to which manner gas heating can replace most conveniently coal fuel under the industrial boilers. Large gas-heating systems have been constructed already to be used for industrial purposes, but it seems that little has been done yet to standardize their construction and to educate power engineers in their use. The human mind is really very slow in taking up novelties. In fact, we do everything in our power to restrict the progress of new ideas as much as possible, because we are afraid of the unknown result that might follow. If the gas industry can expect, however, from the introduction of gas heating the advantages that are promised by those who are supporting the change, it should certainly be worth while to make a determined attempt to carry the plan into reality.

Bringing gas as a fuel to our steam power engines is the most economic way of firing, and it is also the most economic way of aiding the evolution of fuel consumption that is needed in the interest of the nation. tI can be effected without disorganizing the present power supply system of our industry, because it replaces merely the fuel and not the equipment.

It will be seen from this that there cannot be any question of solving the industrial power problem of to-day by any single experiment. It is not the gas engine, neither is it the gas-heated boiler, nor electricity, nor wind, but a combination of all these, each applied to its best advantage, that will lay the foundation to new progress. It would also be wrong to assume that our present known means of power development are the only ones in existence. The fact that we know no other is no proof. In a short while some new source of primary power may be discovered, making a further step ahead in power supply and development.

Power is an essential condition for all industrial activity. Its economic use is, therefore, as important as the economical use of raw materials and labor. The gas industry should not fight for any special interest but exclusively for attaining the greatest benefit to all, and especially the power consumer.

No Force in the World Can Stand Up Against Aroused Public Opinion

(*Continued from page 254.*)

to whom they had intrusted their careers, they must be regarded in the light of actually being an integral part of the organization. The most oft-repeated expression heard among the laboring men was, "Why, I'd do anything for my boss." They felt and knew that the man over them would get fair play for them and they were loyal to him. Let anything untoward interfere with him and his supporters would rally to him at once. That was the feeling among the older men of the industry.

"Once in a while we get some young fellow who has some rough ideas," said a working man, "but he doesn't get far with us old fellows. It's just among the youngsters that he makes any headway. Now just take my boy. He got tired of going to school when he was just a little fellow and the first thing I knew he was hanging around the street corners and getting into all kinds of bad company. As soon as he was old enough I got him a job here with me where I could keep a watch on him. He enlisted in the war and when he returned he didn't want to settle down to anything, and he was dissatisfied with the home. But he came back to work here and the first thing I knew some of the men we had got in here during the war were after him, filling him with a lot of notions that didn't do him any good. But I couldn't talk him out of his ideas and he was all the time talking strike and quitting and better hours and more pay and a lot of other things.

"Now I got my hands full keeping him at work and there is no telling when he will try to break away, and God knows what he will do one of these days."

Who is to blame for this condition? Surely not the

father who has done everything within his limited means to make a good citizen out of his son. On the contrary it seems to the writer that the executives of the company are neglecting their duties in not finding some means of educating this youth and thousands like him to his duties and opportunities. It would be only a short time if his thoughts were properly guided until he would become a power for good in his immediate sphere in the plant and a mighty valuable employee for the company.

When these series of articles was first undertaken it was not realized the lengths to which they would lead nor the by-ways, but as each thread of thought advanced by the various people has been run down the results so far as they apply to the gas industry will be set down in these pages with the hope that they may help each operator to better understand his own problem and will help in the construction work that is taking place.

The Oil Shales Industry in Scotland and England

(*Continued from page* 260.)

DISADVANTAGES

1. One hundred gallons of water, in the form of steam, are needed for each ton of shale retorted. This may be difficult to obtain in a semi-arid region.
2. Increased first cost of installation and subsequent cost of condensation.

After a two months' personal study of the oil-shale industry in England and Scotland, I am led to the following conclusions:

(a) The present Scotch methods are well adapted to the shale treated; they are commercially successful and meet the local conditions.

(b) The Scotch plants are the result of seventy years of operation; they have been improved from time to time, but naturally are not now so arranged as to be highly efficient from an operative point of view, yet it would be folly to scrap them and rebuild on more modern plans.

(c) Scotch methods should not be slavishly followed in other countries unless conditions are identical.

(d) The problem in Scotland is one of operating efficiency—the difference between cost of production and selling price.

(e) The problem in England is not yet a commercial one—but technical.

(f) The presence of an excess of sulphur in all oil shale deposits of England demands that some effective and economical method for the elimination of the sulphur be devised.

(g) Where sulphur does not occur to an objectionable amount, as in the United States, the serious problem is the design of an efficient retort.

(h) Many retorts are in process of development. At the present writing, it is virtually impossible for any one (except the inventor himself) to select the best.

(i) In my judgment, the successful retort will be one of three types:

1. The present Scotch type, where local conditions are identical with those in Scotland.
2. A vertical, modified Scotch type, adapted to shale rich in oil, but low in nitrogen content, or
3. A horizontal type, which will be based on correct scientific principles and be absolutely new.

It is not impossible that successful retorts will result of all three types. The keynote to the successful production of oil from shale is a retort adapted to the character of the shale to be treated.

Chamber of Commerce Issues Cost System Bulletin

In a bulletin just issued under the title, "What a Cost System Should Do for You," the Fabricated Production Department of the Chamber of Commerce of the United States call attention to the purpose and value of cost accounting.

"Accurate information regarding the various elements which go to make up costs," says the bulletin, "automatically eliminates arbitrary, empirical or guess costs which prevail to a surprising degree among manufacturers. Cost keeping brings to light inefficiencies in system by calling to attention the cost of its operation and points out equipment that has become inadequate by showing an excessive cost of product coming therefrom; it points out employees who are below the standard required and permits of performances being kept within certain limits by watching the accumulation of costs.

"Increased production depends largely on the intimate knowledge the management has of all elements in their manufacturing operations which can only be supplied through an adequate cost system. It enables them to establish proper control and increase output as warranted by the cost record.

"In many plants considerable sums of money are pent to establish a standard practice of operation. From time to time certain variations from the established standard practice occur, affecting costs in an adverse way. Timely costs reports showing what is happening, rather than what has happened, suggest immediate correction of such inefficiencies. It is not sufficient that executives know that expenditures are excessive; they should be supplied with information to show exactly where these excessive expenditures occur and take action. Definite responsibility for expenditure as the authority to make the expenditure should be fixed by an adequate system of cost accounting."

The bulletin takes occasion to say that part of the work of the Fabricated Production Department will be to assist organizations in obtaining for the industries they represent cost systems as practicable and as simple as possible.

"We shall not either devise or install cost systems," it says, "but by co-operative study of each situation, aided by the contributed experience of trade organizations and expert knowledge of the subject, help those who are disposed to help themselves."

Window Cards You Can Use

By ERNEST A. DENCH

More able experts than the writer have dealt with the technical details of window show-card writing. It is already assumed, therefore, that you are acquainted with these fundamental details.

But what you cannot have too many of are clever sentences and phrases in order to prevent the public from getting tired of your window-card efforts. If there is anything in addition to a seldom changed window that pales on spectators, it is the window card left in from day to day and month to month. Many times window displays are altered when window cards are not.

However, if you are stuck for brilliant suggestions, you need not be any longer, for a number of your fellow merchants have all combined to help you out of your present difficulty.

Giving Your Policy

The policy of your stores can be given effective publicity in many ways, and one of these is the window-card route. The window card allows you to give more detail to your policy than does the slogan, yet not quite as much as is possible in a newspaper advertisement. The window card, therefore, strikes the happy medium between the slogan and the newspaper ad.

"Complete satisfaction is what you pay for here and you get it every time."—American Mills Company, Terre Haute, Ind.

"Our best ad is the wagging tongues of satisfied customers."—Petot Shoe Store, Terre Haute, Ind.

"It has taken us five years to multiply our sales by five. Satisfaction is the cause."—Standard Drug Company, New York City.

"The prestige we enjoy comes from having served many people satisfactorily. Let us serve you."—J. Britton, Montreal, Canada.

"Yes. We refund your money on any unsatisfactory purchase."—M. Mantis, New York City.

"Satisfaction—We do not pay commissions to our customers for sales made to other customers We give all our customers good service. We therefore expect them to reciprocate by recommending us to their friends."—The Vacuum Cleaner Specialty Company, New York City.

"Patronizing us means money well spent. We count no trouble too great to give you exactly what you want."—Mound, New York City.

"We need you as a customer. One trial please."—Bryson's, Montreal, Canada.

"Your good will is the greatest asset we can have. To get your good will and keep it, we must live up to what we say. Should anything you purchase here prove unsatisfactory, please return it for exchange. Or, if preferable, your money will be refunded."—Miller, New York City.

"Without your good will, our chain of shops would have a missing link."—Alphen, Washington, D. C.

"Here is the store that has made good for years. It protects you against misrepresentation. Safety first."—Marcus Brothers, Brooklyn, N. Y.

"Phelan's Method—The Public Be Pleased."—Phelan, Brooklyn, N. Y.

"This store is run for profit, but not at the sacrifice of principle."—Standard Drug Company, New York City.

"There are 57 rules for doing good business. The first is—Deliver the goods. Never mind the other 56."—Hugh A. Vaughn, Decatur, Ill.

"Yes, come in even if you are in a hurry. We are proud of our quick service." — Ebingers, Sheepshead Bay, N. Y.

"Once a customer, always one. Courtesy our watchword. Look us over."—Sterling Company, Brooklyn, N. Y.

"Our success is not due to the profit we make, but to the service we give."—Buckley, Newhall & Co., Brooklyn, N. Y.

"Service—The Service we give brings us more customers than our advertising."—Vacuum Cleaner Specialty Company, New York City.

"We have imitators, but they are a mile behind."—Federal Bakery, Decatur, Ill.

Seeking the Price

Unless there are price tags in the windows, one flies to the window card with the expectation that it will give the desired information if only one or two priced lines are displayed. The window card as a method of price information is therefore not to be despised. Smaller cards might be used to give the desired information, while larger cards can convey what your general attitude is in regard to prices and values in these H. C. L. times.

"What you save here on one purchase, helps you to buy another."—Levittan, Brooklyn, N. Y.

"Cheer Up. Whatever goes up must come down."—Snyder, Newark, N. J.

"Buy Carefully and wisely. Find this store with high-grade merchandise and low prices. Volume our watchword." — Wallace McPhee, Brooklyn, N. Y.

"Not the cheapest, but the best at the lowest price."—Vogel & Co., New York City.

"The store you read about. The prices they talk about."—The Outlet, New York City.

"Our goods are right, so are our prices"; "The right goods at the right prices"; "Low prices and high quality keeps us busy."—U. S. Auto Supply Company, New York City.

"What you save here on one purchase helps you buy another."—Kaufman, New York City.

"You, opportunity seeker, cannot pass by without taking advantage of these values."—Brooklyn, N. Y. (Phelans).

"We let our values do the talking. Your judgment will do the buying."—Kaufman, New York City.

"Sale? No. Value? Yes."—Paramount Shirt Shops, New York City.

QUALITY FIRST

The price appeal is not everything to certain clienteles,, and if yours is one that places quality before price, the following suggestion may prove of use to you:

"Remember that the best always proves to be the cheapest."—Bachman Brothers & Martin, Decatur, Ill.

"If it's from Sam's it's good."—Sam's, Decatur, Ill.

"We always figure the better the grade the better the trade."—Wiggans, New York City.

"These suggestions are for particular people."—Mammoth Shoe Company, Terre Haute, Ind.

Merchandising or Merely Selling

Batterby had gone home for the evening. The garage was in charge of a pert youngster. I couldn't see his face, for he was doubled over the engine of a car adjusting the carburetor or something. So busy was he that he did not hear me until my third greeting rose to a middling-sized yell. Then he half turned.

"I have a leaking radiator," I informed him, "and it bids fair to spoil my hunting trip to-morrow Have you—"

"Nothin' doin'," the young fellow interrupted. "Mechanics have all gone home Have to wait till Monday. Huntin's no good, anyhow."

"But," I persisted, "can't you give me something that will stop the leak? Anything that will—"

"Yes, got solderin' paste. You might heat an iron on the gas stove an' fix it yourself."

"Son"—I was hot—"the only irons we have at home are the ironing variety. I'd do a peach of a job with them. Besides, I wouldn't be allowed to use them for the purpose."

My sarcasm went over his head. As I started off he remarked that only a nut would try to solder with a sad iron.

"Well," I declared, "I'll try Cook."

Dave Cook has a pretty neat garage and carries a nice line of accessories.

But only the night man was there. He was busy sweeping, and evidently couldn't see me for the dust. I waited a long time, and finally tapped him on the shoulder.

"Have you something that will stop a leak in a radiator?"

He looked puzzled. Probably he thought of suggesting a plumber or steam fitter.

"You know," I continued, "some dope you put in and after a bit the leak stops.

"Naw." That was all I could get the fellow to say. He seemed reluctant to give up sweeping. It was late, and I knew supper was waiting. So, feeling unable to wait an hour for him to finish sweeping, I made for the accessory case, intending to help myself. With a grunt he dropped the broom and came over.

"Here you are," I announced, "just the stuff I want. Here's the change. I'll put it in at once."

"No, you don't. That sells for a dollar a can. Seventy-five cents won't go here."

"But it is printed on the can," I protested. "Besides, it's widely advertised at that price."

"Maybe it is," he snorted, "but we don't consult the manufacturers when we price our stuff."

In the hurry I was, I came near paying the extra 25 cents, but the fellow's surly manner and his utter indifference changed my mind.

"All right," I said, "I guess my car will do without this particular can."

Again I was on the street, and the water still dripped from the radiator.

"Garage men may be good mechanics," I thought, "but most of 'em are poor business men—at least hereabouts. Now there's Batterby. He knows a car from A to Izzard, but when it comes to selling stock that he has money tied up in he leaves it to a brainless boob in dirty, greasy overalls to do the selling. Which the boob doesn't do anyhow."

As I was wondering what to do next, and feeling the call for supper, I happened to glance up the avenue and see the sign of "Whackhammer & Anvil, Hardware." By heck! Why didn't I think of them before? Good thing they're open this evening."

A moment later I chugged up in front of the store. A polite salesman advanced to meet me. No waiting around as I had done in the garage.

"Good evening," he smiled. "Going hunting to-morrow?"

"You bet," I laughed. "How did you guess?"

"Oh," he replied, going to the hunters' outfitting counter. "I saw you eye this counter as you came in."

"Well, you're right. But personally I generally hunt with a book or magazine. Still—well, got any new thing for hunter's luck, comfort or efficiency?"

He showed me, and also gave me some valuable tips on locations where this game and that would most likely be found.

"Guess I won't take a book along to-morrow. Give me an extra amount of shells. Say, that's a peach of a new cartridge belt. Guess I'll have to have that."

"And this hunting knife?" he suggested.

"Yes, a knife and some—"

Before I knew it there was quite a pile of stuff to pay for, whereas I had not thought of buying it when I entered.

"Now," I remarked, as he wrapped up the bundle, "if I only had the radiator fixed, we'd be all right."

"Radiator leaks?" he said, sizing up the situation in an instant. "Don't let a little thing like that worry you." He reached back to a shelf. "Here's the dope. A dose of this will find the leak and stop it in a hurry."

"That's what I want. How much?" I wondered if it would be the price fixed at the other place.

"The price is printed on the can. We always try to sell at advertised prices. Now, how about punctures? Are you prepared?"

I was not, and confessed the fact.

"Well, here's a tool no motorist should ever be without—on long trips especially. You may be miles from everywhere, and no one to fix a serious break but yourself. With this drill—"

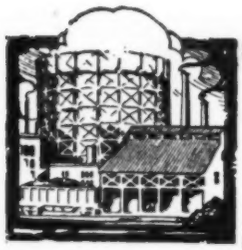
I bought it.

"You probably need some water," said he, while helping me with my bundles. "Here's the key; help yourself to the water in front."

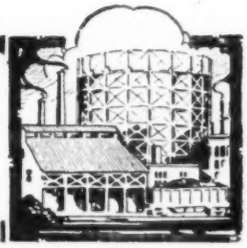
As I filled the radiator and put in the dope, I reflected on my transactions. It had been my intention to spend 75 cents in Batterby's Garage, yet the check I wrote was over $50. Was I sorry? You bet I was not.

Brooklyn Union Gas Bonds

The Public Service Commission has granted an application by the Brooklyn (N. Y.) Union Gas Company for authority to issue 5 per cent bonds to the amount of $38,000 under the first cons. mortgage for $15,000,000 maturing May 1, 1945, to be sold at not less than par and accrued interest.



NEWS OF THE GAS INDUSTRY



Increased Rates and B.t.u. Standard Discussed in the Report of Investment Bankers' Assn.

The statements that it is quite feasible to produce an artificial gas for non-luminous and industrial purposes with the use of very little oil, and in many cases without using any oil at all, and that the gas industry must expand if the industries depending on heat are to obtain an economical fuel, or homes to receive the advantage of an essential and most desirable form of service, together with the denial that gas is being supplanted for heating purposes by electricity, are outstanding features in a report just issued by the Investment Bankers' Association, of New York and Chicago. The report was written by H. M. Addinsell, chairman of a committee on gas securities.

The matter of selling gas on a heat-unit basis instead of for its illuminating value, as is being done in Great Britain under a very recently adopted regulation, also is discussed. In this connection the report states that it clearly is apparent that gas should be produced as economically as possible, that the consumer may get the most value for his money. The greatest economy in production, the report contends, can be accomplished only by eliminating both the artificial standard of illuminating value and the artificial standard of heat value to the lowest point consistent with economical production and good service to the consumer. The report then urges that all such artificial standards be done away with, and that manufacturers make a concerted effort to produce gas as cheaply per unit of heat value as possible.

Supporting his statement that electricity is not supplanting gas, Mr. Addinsell states that the total amount of gas sold in the United States has increased from about 118 billion cubic feet in 1908 to more than 300 billion cubic feet in 1919, an average yearly increase of approximately 13 per cent, with the rate of increase being larger during 1919 than any preceding year. He declares that gas is pre-eminent for cooking and other vital domestic uses for the reason that no other method combines the economy, cleanliness and convenience of cooking by gas.

Mr. Addinsell also sees a strong tendency on the part of the more than forty-five million consumers of gas in some 4,600 separate communities, as well as by the public service commissions, to recognize the pre-eminent fact that gas manufacturers and all public utilities are entitled fairly to the same rate of income as all other lines of legitimate business, and that a necessary public service can be rendered only if a rate of return be allowed sufficient to encourage capital to invest in and develop the public utilities. The high prices of materials and labor since 1916, without commensurate increases in rates, the report states, have reduced net earnings of gas companies.

Mr. Addinsell goes on to say:

"The tendency of all public utility commissions to-day is to recognize that public utilities are entitled to the same rate of income as other lines of legitimate business. They are coming to realize that the services rendered by the public utility companies are a public necessity and that such service can only continue to be rendered if a rate of return is allowed which will encourage capital to invest in public utilities and to develop their business.

"The gas industry suffered from the delay of the commissions in recognizing this necessity; and while full and adequate relief has not as yet been universally accorded, the fact that the needs of the gas companies to increased rates are being recognized by the commissions fully as much as the needs of other public utilities is indicated by the fact that increases in rates have been granted to upward of five hundred gas companies since the beginning of the war. Furthermore, the language used by many of the commissions in handing down recent decisions indicates the growing appreciation on the part of the commissions of the justice of the companies' position in asking for increased rates and is in contrast with the decidedly grudging manner in which most of the early increases were granted."

Shale Co. Superintendent Has Distinction of Being First Lawyer in Center for Which Great Developments Are Expected

Lawrence Bothwell, field superintendent of the Anglo-American Shale & Refining Company, has moved his family to De Buque, Col., and, in addition to his duties with the shale company, has opened an office for the practice of law.

An enterprising law-book firm, discovering promptly that a prospect existed where none existed before but not knowing his name, made the world aware that even the United States Government was not uncognizant that a new distinction had come to De Buque—a letter addressed to Mr. ———, Attorney at Law, De Buque, Col., was, without delay, delivered to Mr. Bothwell.

Gas Holder at Algiers to Be Repaired

Arrangements have been made to have the 150,000 cu. ft. two-lift holder at Algiers, La., put into first-class order by supplying a new cup for the inner section, together with the repairs to the outer section.

The materials are now being fabricated by the Western Gas Construction Company, of Fort Wayne, Ind.

Federal Court Upholds Right of State to Regulate Price of Fuel Mined Within Its Borders

The Federal court, for the district of Indiana, has upheld the right of the Hoosier Legislature to enact a statute, providing for a coal and food commission in Indiana and for the fixing of prices on such commodities by the commission. The opinion, which came in a test case, presided over by three Federal court judges, is of the most far-reaching importance to utility companies, and particularly gas companies throughout not only Indiana, but the nation, for the ruling unquestionably will be precedential and establishes the right of a State to control the prices of the fuel mined within its borders.

The new coal commission in Indiana, with Jesse E. Eschbach at its head, has just announced that it will begin the fixing of coal prices some time in October. This probably should mean that many gas utilities should receive relief immediately from a situation that has become very grave. The opinion, given in the Federal court in Indianapolis, has just been issued by the new coal commission to various elements of the population throughout the State of Indiana, for their guidance. It follows herewith, in part:

The Federal Government, being a Government of listed, delegated powers, never had any general totality of sovereignty, as the States originally had. The Federal Government has no sovereignty except that which was cut off from the States and welded together to make what there is of national sovereignty. The Federal Government has no general police power, but with respect to war it is the successor of the State in police power—the power of the State to protect itself, the power to determine its own necessities, the power to protect the health and welfare and morals of its people. No dispute has ever arisen when health and morals were concerned. When you get down to welfare the question is frequently raised about financial considerations. But, of course, the State has a right to protect its people with respect to financial considerations. All of our blue sky laws, and our married women surety laws, and our laws restricting the sale of patent rights, and our laws controlling fire insurance rates, and our exemption laws, are all financial questions, looking to the welfare of the citizens of the State, and, ultimately, the welfare of the State, because the State has an interest in the welfare of all of its citizens and inhabitants.

The Federal Government, with respect to the war power, is simply the successor of a part of what was once the State police power. The national power, with respect to war, is simply a piece cut off of the general power that belonged to the original States, which might have kept up, if they had chosen, each for itself, an absolute, full sovereignty.

Now, under that war power, which, in the national scheme of government, stands exactly analogous to the police power of the State, what has been done? Of course, the war power has been interpreted, and had to be interpreted, in view of the restrictions in the Federal Constitution, had to be construed with respect to what was reserved in the Federal Bill of Rights—the first ten amendments, and particularly the fifth amendment.

We never thought, for a moment, that this war power authorized the Federal Government to go out and take a man's property without compensation. No. The Food Administration did not appropriate a man's property without due compensation. The Fuel Administration did not propose to take his coal away from him without due compensation. The Federal Government has this war power, originally the police power of the State, and it would have all been in our State, fully and completely, if it had not been assigned to the Federal Government, and when assigned its character did not change a particle, but it remained the police power, and under that police power, interpreted with the other provisions of the Federal Constitution, you cannot take a man's property from him; but the Congress has declared, and, so far as the courts have passed upon it, they have said that under that assigned part of the State police power, the right did exist to regulate conditions of handling, and the prices of food and fuel. If the police power stops, it will stop when and where civilization and human rights stop, and not before. These questions are questions for each generation—each generation of free men; it ought to be so, and, under the law, it is so.

Now, is there any rule for determining when the Federal courts shall interfere, under the Fourteenth Amendment, with a State statute enacted under the police power? Yes. The best analogy, to by mind, is the basis on which an appellate court interferes with the verdict of a jury. If there is no basis on which a reasonable man could arrive at the result, it is set aside. Otherwise, it is not; even though the court, sitting as a jury, might have found the facts the other way.

It is only when either no basis of fact exists on which to lay the Legislature's finding or when the remedy prescribed by the Legislature has no possible relevant bearing or connection with the evil to be cured, that the statute is set aside.

As an illustration of that last feature, let us assume that the city of Indianapolis has passed an ordinance regulating the sale of fruit by retailers, which provides that the fruit shall be protected from flies and dirt by keeping proper netting over it, even prescribing the size of the openings in the netting. I assume that nobody would dispute that that was a reasonable exercise of the police power, to protect the health of the people. But, suppose the council, finding the same evil existing among these vendors, not very cleanly, and not acquainted with the germ theories regarding the spread of diseases through the excretions of insects, should prescribe as a remedy that these fruit vendors should wear red plug hats? Of course, that ordinance would fall as an unreasonable, arbitrary, whimsical exercise of the police power, because, so far as we are now informed, there is no reasonable connection between the evil to be cured and the way in which the city council said it should be cured. But, as we have heretofore indicated, control of prices is known of old as a remedy for extortion.

This leads to the conclusion that all aspects of this bill are premature, except this one on the general power of the State. We are satisfied that the general power of the State to touch, in some way, upon the coal mining industry, exists. If, by actual orders, the State of Indiana, through its Coal Commission, should make a requirement upon some particular coal operator, that, insead of being favorable to his interests, as the suppositious order that I stated a while ago, was deemed by him to be detrimental to his interests—detrimental by reason of a conflict between the order and the rights guaranteed to him by the Federal Constitution, then he would have a right to complain. That would be the time to determine whether the particular order did, in fact, infringe some right of the plaintiff—not theoretically, but in a way to inflict a trespass, an actual im-

pending trespass upon his property rights. The question about contracts, about violations and impairments of existing contract rights, could be raised at such a time. That is all purely speculative and conjectural, now. And it is also purely speculative and hypothetical, even now, to inquire whether the plaintiff in such a case would have a sufficient legal remedy in the Circuit Court of Marion County, or whether he would be entitled to the prompt intervention of the Federal court.

This discussion of the one underlying principle involved in the hearing of this motion for the preliminary injunction also goes to the heart of the motion to dismiss. That is, there is in this bill—speaking now for myself, on the motion to dismiss, which is before the district court—there is no basis in fact for injunctive relief, except this one of want of power. The power existing, that ground disappears from the bill, and the other grounds present theories of what might happen and not allegations of fact respecting an existing situation—except as to those items of the $25 ad the license tax of 1 cent a ton.

The order will be that the application for a temporary injunction is denied, and on the motion to dismiss, the order will be that the bill is dismissed without prejudice.

That means that there is absolutely nothing in the bill, now, in our judgment, that warrants either a temporary injunction or a final injunction. You cannot make any proof as to a hypothetical condition in the future.

The bill will be dismissed without prejudice ad the record may show affirmatively that there is absolutely nothing decided except the one question, that the State, under its police power, can lay its hand upon the coal mining industry. There may be, today, wholly private businesses that we would have no hesitancy, to-day, in saying were beyond the reach of the Legislature—saying so, just as we would say in case of a verdict of a jury, because there is no basis of fact upon which to predicate such a finding; but our sons, or our grandsons, may find a very urgent necessity for including that class of business, or enterprises, within the regulation of the State, under its police power.

Hearings on West Virginia Steptoe Gas Law

Hearings on the suits entered in the Untied States Supreme Court by the States of Pennsylvania and Ohio to enjoin the State of West Virginia from enforcing the Steptoe gas law, recently enacted by the West Virginia Legislature, are in progress in Pittsburgh. The hearings, which are to determine West Virginia's right to refuse to send gas outside of the State until the needs of her own users are fully met are being held before Commissioner Levi Cook, appointed as master by the United States Supreme Court, in Pittsburgh.

A number of consulting engineers and officials of the leading gas companies operating in Ohio, western Pennsylvania and the northern part of West Virginia have given testimony the last few days. The production in the northern part of West Virginia has diminished perceptibly and the decline is becoming felt in the southern section of the State, according to the testimony of one witness, upon cross-examination by Attorney George M. Hoffheimer, for West Virginia. The decrease will continue steadily regardless of the Steptoe act, the witness asserted, but he insisted that if industial consumers were shut off and the supply confined to use for lighting, cooking and water heating in the homes, natural gas produced in this State will be available for use outside of West Virginia for years.

Within eighteen months after the provisions of the Steptoe law became operative, there would not be any natural gas from West Virginia available for transportation to consumers in Pennsylvania, Ohio, and Indiana or elsewhere, according to J. K. Anderson, consulting engineer of Clarksburg, W. Va., a witness mefore the master.

According to Mr. Anderson, consumers in West Virginia now would be increased by industrial concerns which would be attracted to that State by the low price of fuel and the possibility of obtaining enough natural gas in winter to operate their plants. It would be but a short time, he said, until these consumers would use all the gas available from West Virginia during the winter months, the Steptoe law providing that all the requirements of West Virginia consumers must be met before any West Virginia gas is transported outside of the State.

More than 2,406,000 persons in Pennsylvania and 4,429,380 in Ohio would suffer during winter months were the Steptoe law enforced, Mr. Anderson testified. He stated 40 per cent of all natural gas used in Pennsylvania comes from West Virginia and a large proportion of that used in Ohio is transported from West Virginia, and to deprive the people of these States of the proportion of their requirements of natural gas would result in a great hardship and force these consumers to turn to other fuel.

There are over 480,000 consumers of natural gas in Pennsylvania and nearly 900,000 in Ohio, according to figures presented by Mr. Anderson. The Government figures that five persons enjoy the use of natural gas for every consumer listed, hence the large number of persons directly affected by any enforcement of the Steptoe law.

In commenting upon the financial loss involved should the Steptoe act be enforced, Mr. Anderson stated a large part of the homes and industries in Pennsylvania and Ohio depending upon natural gas for fuel would have to be changed should the natural gas service become so unsatisfactory through operation of the Steptoe law as to be useless. He stated appliances, chimneys and flues would have to be changed at a great expense to the consumers, as most houses now are constructed with small flues, which would not operate with other fuel than natural gas.

Hospitals, schools and other public buildings in Pennsylvania and Ohio are vitally interested in obtaining a supply of natural gas from West Virginia, Mr. Anderson asserted, and he said enforcement of the Steptoe law would add great expense to the operation of these buildings and institutions through increased cost of fuel and changes necessary.

That lives of gas consumers would be imperiled and property menaced should the Steptoe act be enforced, was the contention made by Mr. Anderson, who said a sudden lowering of the gas pressure at night in homes might cause explosions or fires, and that this lowering of the pressure might result from a cutting off of a large part of the supply of natural gas.

Eugene P. Whitcomb, of Pittsburgh, president of the Union Natural Gas Corporation, was another witness at the hearing. He said that if his company was denied natural gas from West Virginia, as might be the case should the Steptoe law be enforced, it would mean ruin and

demoralization of the gas companies connected with the Union Natural Gas Corporation doing business in the southern district of Ohio and in Indiana. Compressing stations had been built and pipelines laid primarily for the handling of gas from West Virginia, he said, and should this gas be cut off the pecuniary loss to his company would be approximately $6,521,254.

Mr. Whitcomb, remarking upon the failing natural gas supply, said serious consideration must be given the erection of plants to produce mixed, artificial and natural gas. This mixture, he said, would not be as rich as natural gas and would not have as high a heating value, yet it would cost much more. All means are being employed, according to Mr. Whitcomb, to develop new fields but the number of consumers is increasing while the supply is decreasing.

Mr. Whitcomb said in the period from 1910 to 1915 the cost of drilling gas wells averaged from $5,500 to $6,500 a well, and from 1915 to the present time the cost was from $12,000 to $15,000. He said the wells drilled prior to 1915 produced about three times as much gas as is now produced by wells which cost from $12,000 to $15,000 to drill, hence the real cost of the gas was six times as great now as prior to 1915.

Enforcement of the law, therefore, Mr. Whitcomb said, would not only reduce the supply of natural gas to the vast industrial district of Pittsburgh to such an extent as to make the service there too unsatisfactory to be of general use, but also would shut off entirely the natural gas supply in Dayton, Lancaster and other towns in Ohio and in Muncie, New Castle and other points in Indiana.

Sixty-Year Gas Franchise Is Granted by Union City Council

A sixty-year franchise for a gas plant for Union, S. C., has been granted to the McNally Cotton Company, its associates and assigns, provided the terms of the franchise are accepted within three months and work in good faith begins within six months.

The proposed gas plant will have a right to use all streets and alleys for the laying of its gas mains and under the franchise must establish and operate a thoroughly modern plant, selling gas to consumers at rates as low as any other towns of this size.

The plant will cost approximately $250,000, but no site has yet been decided on.

The McNally Cotton Company, to whom the franchise was granted, has associated with it a big corporation which has modern plants in different sections of the country and considered establishing one in Union because this town is recognized as such a wide-awake and growing town. The franchise provides that the plant shall be completed within twelve months from the date of the written acceptance must be within three months after its being granted by the city council there.

The plant when established will furnish gas for cooking, lighting and other purposes and it will place Union in line with other progressive places.

Dr. Goff and Associates Buy Crystal City Gas Co.

Dr. George S. Goff and others associated with him whose names have not yet been announced have purchased the interest of B. W. Wellington in the Crystal City Gas Company which distributes in Corning, N. Y., and vicinity the natural gas purchased at wholesale from the Potter Gas Company of Pennsylvania. The Wellington stock amounted to 52 per cent of the stock of the gas company, and with its purchase Dr. Goff and his associates secure control of the Crystal City Company.

A meeting of the stockholders of the Crystal City Gas Company will be held shortly to elect a new board of directors for the company and for the transaction of other business. At that time, it is expected that a statement will be available as to those who will be associated with Dr. Goff in the control of the company. This group will control about 70 per cent of the stock. The Crystal City Gas Company's holdings are valued at $300,000. The original investment in the plant was around $300,000.

Benjamin W. Wellington has been president of the company and W. B. Hunt secretary and treasurer.

Dr. Goff was instrumental in bringing into existence the Crystal City Gas Company which secured the natural gas supply for this city which had been talked of for a number of years before it became a reality. He has been general manager of the company for some time.

William M. Gurnsey, who has been superintendent of the Crystal City Gas Company since the company began business 15 years ago, has presented his resignation to take effect October 1. Mr. Gurnsey is at that time to take a permanent position with the Corning Foundry, Inc., a Wellington enterprise, in which he has since its inception had a share in the management. Mr. Gurnsey has been exceptionally tactful in his dealings with the public while representing the Crystal City Gas Company and he will be missed by the company's patrons.

Bank President Notes Change in Attitude of Investors Toward Public Utilities

Confidence of investors in the fairness of the general public in Illinois is fast being restored and a resumption of the investment of savings of the thrifty in permanent improvements such as extensions to electric, gas and telephone plants may be looked forward to, is the belief of Joseph E. Otis, vice-president of the Central Trust & Savings Bank of Chicago. In discussing the recent inclination of investors to again buy securities in these companies, Mr. Otis stated that public sentiment seems to have radically changed and that, with the exception of Chicago and a few other places, city officials are now co-operating to bring about conditions such as will permit investment of money in the upbuilding of their communities.

"Up to the change of conditions caused by the war," says Mr. Otis, "public utility financing was the easiest kind to handle. Railroad securities were regarded with some disfavor, at least in this territory, and the great body of investors were not much attracted by industrials, except in the case of a few very well-known corporations or where such issues were offered on a real estate rather than an industrial basis.

"During substantially the decade before the war there had been constant standardization in the case of the public utilities. There was comparatively little fluctuation in the cost of construction; operating costs were very accurately known and rates were almost universally adequate to produce a reasonable return not only upon a liberal valuation but somewhat in excess of this amount. The adoption of the commission form of regulation in a constantly increasing number of States tended further toward the standardization of financing.

"Owing to the prosperity and apparent stability of the industry, a vast amount of money flowed into it through investment channels. These funds were for the greater part expended in ways from which the community as a whole derived great benefit. In the larger cities the use of gas and electricity was constantly broadened and the street railway corporations were able to make adequate extensions and keep their equipment in a high state of efficiency.

"Another interesting development was the carrying out of the central station idea. Prior to this time small communities had electric light plants either constructed by the municipalities themselves or through local investment. These plants, owing to their inability to finance themselves adequately, were for the greater part inadequate and thoroughly inefficient. It was found that the transmission lines operated from a central station could give much better service at much lower rates and throughout the entire country there was a group of small plants into systems served by efficient central stations.

"The status of the public utility companies which seemed to have attained so remarkable a degree of stability was completely changed by the war. Equipment was hard to get and obtainable only at excessive costs, operating expenses increased by leaps and bounds owing to violent fluctuations in the market for coal, coke, gas oil and other supplies, to say nothing of radically changed labor conditions, the standardized basis of operation was completely altered and the companies were called upon to conform to an entirely new standard. The same thing occurred in the industrials, with the very important difference that the industrials had complete control over their selling prices, whereas the prices for the products of the public utilities were subject either to inelastic franchise regulations or slow-moving commission control.

"Up to this period the cost to the public of public utility service had been steadily decreased, and in order to obtain an increase it was necessary entirely to change public sentiment. This was particularly hard to do, for the reason that any increase in rates is naturally unpopular and the politicians seized the opportunity to drag public utility questions back into politics, from which they had been gradually emerging.

"I do not think that the public is reluctant to pay the fair cost of any kind of service. But even in States where there are highly regarded commissions the change in the selling price to meet the increased cost was slower than it should have been. Evidently the commissions anticipated that the existing conditions were merely temporary. This has been shown to have been far from the fact.

"The first part of this war period was naturally very trying. The operating statements of the utilities became worse and worse, until it looked as if not only dividends might be reduced but a number of companies might have to go through receivership. In view of this situation, investment bankers were unable to sell public utility securities in sufficient volume to maintain the status of the companies, to say nothing of enabling them to extend their service to take care of the increasing demand of the communities served.

"If this situation had continued, it is evident that public utilities would have become stagnant instead of keeping pace with the requirements of their commodities. This would have a tendency to bring the utilities into further disfavor with the public, and if it had been allowed to proceed doubtless the whole industry would have had to be reorganized and the only solution would have been municipal ownership and operation.

"Fortunately, public sentiment seems to have changed and there is now, with the exception of Chicago and a few other communities, a rather general recognition of the fact that service cannot be furnished below cost and that to attract capital into an industry there must be a fair opportunity of a reasonable return. Rates have been increased and the hostile sentiment naturally following an increase seems to have subsided and probably would die out if it were not for the activity of those who can use increases as political capital. The financing is still difficult, for the reason that the public is still attracted by industrial securities in preference to railroad or public utility securities. There can be no question, however, as to the great improvement in the last few months, and it is interesting to note that during the last few weeks, for the first time, long-term utility financing has again been successfully carried out."

Dallas Co. Asks Permission to Sell Gas to Industrials

A new rate and permission to sell natural gas for commercial and industrial purposes made possible by the augmented supply after November 15 is asked in an application received by the city of Dallas, Texas, from the Dallas Gas Company.

The application was made following receipt of advice from the Lone Star Gas Company that an industrial supply is now available at 30 cents a thousand feet and the industrial rate asked by the Dallas Gas Company is 50 cents a thousand feet with the usual discount of 10 per cent for prompt payment. The 45-cent net rate, however, will be applicable to consumers who use more than 100,000 ft. a month, those who use less being required to pay the domestic rate of 75 cents less discount.

Under the present agreement the company is not allowed to sell gas for other than domestic consumption between November 15 and March 15, but the augmented supply from the fields will provide a surplus over domestic consumption that will permit a portion being allotted for industrial purposes. Dallas will receive its portion of this industrial gas if the city grants the application but if it is not granted the gas will be supplied to Fort Worth.

Salem Gas Light Co. Holds Annual Meeting

At the recent annual meeting of the Salem (Mass.) Gas Light Company the following officers were elected: Clerk of the corporation, Benjamin W. Sluman; treasurer, Benjamin W. Sluman; directors, Henry A. Hale, president, Samuel H. Batchelder, George W. Grant, C. R. Prichard, A. W. Rogers, John L. Tudbury and Sidney W. Winslow. The annual reports were presented, and showed a small increase in business. Only a few hundred feet of new service was laid. The number of consumers is a little over 14,000, and the total amount of pipe laid is 88 miles.

Boston Consolidated Output

The gas output of the Boston Consolidated Gas Company for August was 457,533,000 cu. ft., an increase of 0.9 per cent compared with the 453,459,000 cu. ft. in the corresponding month a year ago.

Essentials of a Plant Safety Organization

Webster defines essential as "constituting or making that which is next important in a thing." Our question therefore is—what are the most important things in a safety organization? said W. E. Worth, assistant manager, industrial relations, International Harvester Company, in an address delivered before the A B C Session of the Ninth Annual Safety Congress of the National Safety Council, September 28. To the speaker, there appeals seven prime essentials, and they are given in the order of their importance, namely:

1. A sincere desire on the part of the management to reduce accidents.
2. A willingness by the management to intelligently spend sufficient money to achieve results.
3. A realization by the management that constant and intelligent effort is necessary.
4. A man supervising the work who truly believes a safer operation is possible.
5. An organized group of superintendents, foremen, and workmen, all working to a common end.
6. A definite policy and procedure adopted by management and men, and that policy and procedure adhered to.
7. Unflagging enthusiasm.

If these seven prime essentials are accepted as a basis for your conduct, the mechanics of organization can readily be determined. Briefly, these are:

Committees of foremen and workmen, organized for the sole purpose of assisting in carrying on the safety propaganda. These committees should meet at stated intervals to discuss accidents and ways and means of prevention. Considerable discussion in the past has not settled the question of whether there should be joint committees of foremen and workmen, or independent committees. Either will produce results.

Plant inspection by committees. The committees should be given the privilege of making inspection (either jointly or independently) for the purpose of determining the possibilities of improvement in the methods of operation. Many valuable suggestions are received through the medium of these committees.

The work of the safety organization should be based on standards. Have a proper standard for men, methods and machinery. From lack of proper standards arise accidents.

There is a cause for every accident. Find it. If men, educate them; if methods, correct them; if machinery, surround with proper safeguards. It is very important that you devote considerable time to these three factors Regardless of the enthusiasm you may arouse for safety work, if the three above-mentioned factors are not controlled, definite results cannot be had.

Educate the foremen as well as the workmen. The foreman is your mainstay in accident prevention.

In the process of education of the workmen, particular attention should be given to the new man. He should be given a thorough schooling in safe practices by the foreman or one of the older employees in his department. Too much attention cannot be given to this work.

An analysis of the personal injuries and damages to machinery will show (at least it has been my experience) that a very large percentage of the cost is the result of failure to thoroughly instruct and introduce the new employee.

Safety committees should have as members men who understand the various languages spoken in the plant, thereby conveying what you are trying to accomplish by spoken word to all the employees. Creating enthusiasm for safety work among those employees who do not speak the English language is of very great importance. When once they are convinced that here is a service which will benefit them personally, it is surprising the results that can be obtained and the suggestions which they will make. For that reason, it is, as before stated, very important that you have competent men speaking foreign languages on safety committees.

Safety signs should be liberally uesd. Make the wording brief and give it a "punch." The argument may be advanced that these signs are not read. The fact remains, however, that the secret of advertising is repetition. A multiplicity of signs results in a continuous affirmation of the importance of playing safe. Affirmation and repetition result in contagion. It is therefore important to use as many signs as consistent.

Every practical suggestion should be put into effect. If a suggestion is not used, it will pay to spend sufficient time to properly explain in the reason. If it is not convenient to personally explain to the employee, then an acknowledgment of the suggestion and an explanation should be made by letter. However, it is much more satisfactory to personally discuss the matter with the man. An employee will very soon discontinue making suggestions if he is not acquainted with the fact that his suggestion has been considered. On the other hand, if the suggestion is acknowledged even though not used, it will be an inspiration to make suggestions in the hope that some day he will make one that is practical.

Comparative statement of injuries can be used to great advantage in creating departmental or works competition. There has been considerable discussion in the past as to the basis for computing these statements. That, however, is a matter which should be worked out to the best advantage in your particular industry and condition. If it produces the desired result, the method of computing the statistics is immaterial.

Every accident, particularly those of a serious nature, should be thoroughly investigated and cause determined. Accidents which are the result of the failure of men, material, or methods, should be brought to the attention of those concerned, and wherever possible bulletins should be issued telling the cause and how the accident might have been prevented.

Solicit the assistance of the folks at home, the principals, teachers, and children in the school and of the community as a whole. The work within the plant is materially affected by the conditions existing outside the plant. You can well afford to give a reasonable amount of time to the education of the citizens in your community. This will be reflected in the conduct of the men in the plant.

Continually bring to the attention of your employees that it is not necessary and very foolish to take a chance. The chronic chance taker should not be allowed to associate with men and women who are making a conscientious effort for a safer operation.

Diversify your methods of appeal. If it is true that "variety is the spice of life," so also is it true that variety maintains enthusiasm in this work. At no time can the organization charged with the responsibility of a safer operation consider that they have reduced accidents to a minimum. You must keep everlastingly at the work.

Behind the mechanics of a safety organization there lies the spirit of the movement. Your manager is primarily interested in pro-

ducing a profit out of the business and is a busy man. It is your duty, therefore, to keep him advised by means of proper statistics and reports of the benefits arising from this organized effort to make your plant a safe place to work. Keep him advised of the human side of the work. The benefits therein are numerous and unending. You must ever maintain in him a sincere desire to reduce accidents. Show him the importance of spending money to safeguard dangerous places and correct improper practices.

Demonstrate to the management the need of constant effort—"Eternal vigilance is the price of safety." You must absolutely believe in the work, and maintain personal enthusiasm as well as the enthusiasm of your co-workers. Keep your supervisory group working for a given result. Running around in a circle may be good exercise, but we get nowhere. It is therefore necessary to give them a definite goal for achievement. If the goal is reached, you can always set a new mark.

The men who are making the goods that pay the wages and produce a profit necessarily give first thought to production. By making contructive suggestions as to safe practices, you can build a safety organization that will produce the desired result—namely, a minimum of accidents by a safer operation without interference to production.

To Raise Capital for Increasing Facilities Consumers Gas Will Sell Stock to Patrons.

The Consumers Power Company, Jackson, Mich., has launched a campaign throughout its entire territory in Michigan to raise money by the sale of preferred stock to its customers for the purpose of enlarging its gas-making facilities to meet demands, which in many instances have exceeded the company's ability to supply.

"We are facing an important situation," says C. W. Tippy, general manager of the company. "Our present plant capacity has been reached and in some cases surpassed by the demand, particularly for an industrial gas. We are serving all told 2,000 essential industries in the State of Michigan. These are located in a large number of towns and cities of this State. Not only are these industries dependent upon the Consumers Power Company for their power but the entire community must rely upon us for electric and gas service, and if they don't get it in such volume as they need then there is only one possible thing that can happen and that is the progress of every one of these communities will be retarded.

"Such a situation would have its effect upon all classes of business and upon all people, it would effect property values, it would effect wages, it would effect everything that is vital to the life of the community. I do not at all wish to overdraw the situation, and think people will readily appreciate the fact that I am not overdrawing. Electric power and industrial gas and electricity and gas in the homes are essential and unless they are supplied in such quantities as to enable the community to reach out and make new advancement then, of course, the community must suffer for a lack of such advancement.

"As some of our large consumers know, it has already been necessary for us to ask them to reduce their requirements until we could catch up with the situation. They cannot afford that and neither can we. Their business must not be retarded and neither must ours. The people must have electricity and gas and we must furnish it to them. There is just one way we can do that, and that is by raising additional capital to build and buy additional facilities. So far as that is concerned, Consumers Power Company is just like any other growing industry, it must have money to make extensions to take care of new business.

"Our territory and every community in it is growing by leaps and bounds. Their continuous growth is assured if they can get adequate quantities of electricity and gas. These 2,000 industries that we serve employ a total of about 170,000 workers with a combined annual pay roll of $225,000,000, and combined sales output of about $1,500,000,000. It is easy to see therefore how general and widespread is the effect of inadequate service by this company upon the wage earners and the home owners of this and every other community we serve.

"I am trying to put the case in precisely its true light, because I want the people thoroughly to understand how essential it is that this company must have the money to provide additional capacity for the production of electricity and gas. Everybody of course understands the tremendous pressure under which this and all other public utilities have labored as a result of the abnormal conditions created by the war, with the demands for services constantly increasing and the cost of production steadily rising. Of course, it has been impossible for us to provide the additional equipment necessary to keep up with expanding demands and so we have not only reached the limit of our capacity we have far surpassed it, and there is only one way out now and that is larger capacity. That can be provided only as we obtain additional capital.

"Now, since this is a thoroughly mutual proposition between us and the people, we serve we are coming to these people with a proposition for them to take hold of this thing with us and help us to raise the money required to meet this emergency, and put ourselves permanently in a position of keeping up with the demands for service and thus continuing our part as a prime factor in the progress and development of Michigan. We are offering to these people a 7 per cent cumulative preferred stock at $95 per share.

"This plan is what is known as customer ownership. It makes a part owner in the company of every person who buys a share of stock. It is not a new plan. It has been successfully adopted in many communities by other companies to the complete satisfaction of the people and to the mutual benefit of them and the company. Customer ownership has come to be regarded very widely as the best possible approach thus far made to an ideal method of handling the public utility, both from the standpoint of the public and the utility. In the first place it tends to localize the financing and ownership of the property. It gives the people a direct part in the business. It tends to put the utility strictly on its merits and offers what is quite generally regarded as the most practicable form of what may be called public ownership; the utility operated by men skilled by training and experience, owned by its operators and users and regulated by public authority.

"Now let us be clearly understood—the proceeds from the sale of this stock will stay right in Michigan. It will at once be turned back into the various communities from which it has come for their own benefit. It will go to provide larger facilities for the production of gas and electricity. This seems to us to be about a fair a method as could be provided, by which the company and the people together can help themselves.

Milwaukee Gas Light Permitted 15 Per Cent Reduction in Gas Standard

The fight of the Milwaukee (Wis.) Gas Light Company to have the standards of gas lowered in Milwaukee was won recently when the railroad commission handed down a decision permitting a reduction of about 15 per cent. The decision affects the State.

The old standard of 600 B.t.u. a cubic foot was suspended. A new standard of 520 units heating value a cubic foot was substituted. This decision meets the company's request, filed two months ago, when hearings were conducted at the city hall and an effort made to show that because of the shortage of coal and oil it was impossible to maintain the old standards.

Nearly all cities in the United States and Canada are being supplied with gas much lower in heating value than the old Wisconsin standard, it was shown, and some have a far lower standard than the new Wisconsin requirements.

"A careful study seems to show that a moderate reduction in the standard not only will not be noticeable in the domestic consumers' bills, but by the most painstaking scrutiny cannot be detected," the decision of the commission states. "A general survey of other fields reveals unmistakably that standards much lower than ours are being universally adopted.

"The critical situation now existing as regards the shortage of fuel in the Northwest during the coming winter and the undeniably serious situation with regard to the supply of oil for gas making make the argument for the most economical use of these materials a very powerful one, and one that should not be ignored at this time."

The commission requires that monthly reports shall be filed showing the savings made in operations by the reduction of the standards. It also insists that the fluctuation from the standard set shall not exceed 4 per cent below or 5 per cent above.

Officials of the company state that the new standard will effect an appreciable saving in fuel and oil and that the consumer will scarcely be able to notice a difference.

"As a matter of fact," said one, "it has been practically impossible for some companies to live up to the old standard, because it has been impossible to get the materials. Some cities are maintaining a standard so low as 450 units and the results are satisfactory."

Latest Type of Water-Gas Set for Bellingham

The Puget Sound Traction, Light & Power Company, Bellingham, Wash., will soon be able to increase its gas-making capacity to a very great extent by the addition of a new water-gas set.

This machine is of the latest type, with reversing valves, ash pocket and instruments for measuring the flow of steam and air. With this set was ordered a large operating floor. An interesting feature is the grouping of the control levers for the various valves on the set at one point, to reduce to the minimum the time otherwise lost by the operator in going across the floor at each reversal of cycle.

The apparatus is being installed by the Western Gas Construction Company, of Fort Wayne, Ind. The engineering management of the plant is in the hands of Stone & Webster, of Boston, Mass.

Pacific G. & E. Asks Increased Rates for Whole State

Asserting that the price of fuel oil has increased to such an extent that present gas rates were underestimated in items of expense shown by the State Railroad Commission, the Pacific Gas & Electric Company has made application for an increase in rates to be charged for gas throughout the State of California.

According to the petition, the rate amounts to an increase of approximately 2½ cents per 1,000 ft. of gas.

The gas company avers that the oversight of the Railroad Commission has resulted in a rate being allowed that does not meet operative costs.

The commission has, in this connection, declares the gas company, overestimated the gas sales for 1920 by at least 4 per cent.

In its application for a further increase in its rate the company says:

"The price of fuel oil at the time of the filing of the application on which the last increase was granted was $1.81 per barrel for San Francisco Bay delivery. Since then the cost of oil has advanced to $1.93 a barrel. The company estimated at the hearing of the application that it would use in its gas department during the year 1920 2,243,268 barrels of oil. Based on the quantity of gas the company estimated it would sell during 1920, the increase of 12 cents a barrel will increase the cost of each 1,000 cu. ft. of gas sold approximately 2½ cents."

"The reduction of the heat content of gas manufactured in Oakland authorized by the commission will save 55,502 barrels of oil, thereby reducing the company's use of oil in its gas department for 1920 to 2,187,766 barrels," says the petition.

The gas company charges that the commission did not make sufficient allowance for maintenance during 1920, and that its estimate of $699,709 for maintenance is "conservative," and that during the last months of 1920 the company will be required to expend the sum of $302,958 to properly maintain its gas property.

The amount of $90,342, allowed by the commission for taxes, says the company, is quite insufficient.

Strikes Cost Worcester Gas Company $319,775

The annual report of the directors of the Worcester (Mass.) Gas Light Company, which was submitted at the annual stockholders' meeting, shows that the two strikes which occurred since the last annual meeting cost the company $319,775. It is listed under a new item as "expenses general." In spite of this the company had a successful financial year ending June 30.

The income from operations was $1,350,150 and the expenses $1,134,924, leaving a balance on the right side of the ledger of $215,225. Other revenue of $2,354 increased the gross total to $217,579. The net income to surplus was $58,830, making the total $226,698. The total assets are $5,465,892, a gain of $687,779 during the year. During the year the company made 1,089,356,000 cu. ft. of gas, of which 299,470,000 was coal gas and 798,886,000 water gas. Of this amount it sold 1,048,990,000 cu. ft. as compared to 1,048,365,500 cu. ft. the previous year. At the end of the fiscal year there were 37,201 meters in use, an increase of 1,465 in the year.

Court Orders that Public Service Increased Rate Be Reviewed

Supreme Court Justice Swayze in the Hudson County Court House has granted to Assistant City Attorney Charles M. Egan, representing Jersey City, a writ of certiorari which takes to the Supreme Court for review the action of the Public Utility Commission of Aug. 4 in increasing the gas rate from $1.15 to $1.40 per 1,000 cu. ft.

The commission in the same deci sion allowed the company to lower its gas standard and furnish porrer gas for the higher rate.

It is expected that the hearing under this writ before the Supreme Court will take place before the end of September. A decision before the end of the year is expected.

The writ does not operate as a stay and that means that the high rate will continue while the litigation is pending.

In his application Mr. Egan set forth three grounds for the writ.

In the first place he held that Jersey City is being discriminated against under the new rate in that this city with its large population and great consumption of gas is being charged the same rate that is being charged smaller municipalities where the use of gas is much less than it is here.

In the second place Attorney Charles M. Egan held that the Public Utility Commission, by lowering the quality of the gas at the same time that it increased the rate, actually gave the Public Service Gas Company more than it had asked for in its application for a gas rate increase. The company had asked a $1.55 rate but Mr. Egan holds that when the company got an increase to $1.40 with the privilege of furnishing much poorer gas it got more tha nit had hoped to get.

In the third place Mr. Egan held to-day that the Public Utility Commission violated the public utilities act when it granted the increase without adequate notice to the public.

The Public Service Gas Comjany at its Hudson County offices announced that it is awaiting official notice of the orders of the Public Utility Commission reciting that gas charged for in July at the higher rates was charged illegally and ordering a refund of money paid in excess.

The Public Utility Commission last month increased the gas rates, the new rates being from $1.15 to $1.40 per 1,000 cu. ft., but the gas company, it now appears, had no right to charge this rate for gas suppl :d during the last two weeks in July. The new charge is to date only from Aug. 1. Hence the refund order.

Jersey City claims that the new charge ought not to have been made effective until Sept. 1 under the Public Utilities act, which requires ample notice of a rate increase. There was no ample notice in the matter of the gas rate increase, and this feature is to figure in the certiorari proceedings that are planned to have the rate set aside by the Supreme Court.

School Children of Ohio to Be Taught Methods of Gas Conservation

Because of the shortage of natural gas and the very serious situation in the artificial gas industry, due to scarcity of oil and coal, Governor Cox of Ohio, Democratic Presidential nominee, has issued a proclamation through the Bureau of Mines of the Department of the Interior, citing the need for stringent methods of conservation and requesting school teachers to urge upon their pupils the necessity and importance of exerting every possible effort to conserve in the use of gas.

"As much gas is used for household purposes," says Governor Cox, "I feel sure great economies can be effected if proper publicity is given to the seriousness of the situation, and I therefore request that special attention be given this matter in all institutions of learning so that there may be carried to the home suggestions and methods of conserving the supply of gas.

"I further request that the teachers acquaint themselves with the various methods whereby gas may be conserved, and impart this information to the pupils in order that such information may be carried into the homes.

"The State Superintendent of Public Instruction will co-operate in every possible way toward making this movement result in vital good to all communities using gas. He will be glad to furnish information, suggestions and methods regarding conservation at any time.

"It is urged that all teachers give this matter their fullest co-operation, to the end that economies in the use of gas may be effected for the public good."

Expert to Aid Housewives in Cooking with Gas

The Worcester (Mass.) Gas Light Company will furnish the housewives of Worcester with the services of a woman demonstrator who, in the kitchens of customers, will give instruction as to the most efficient use of gas ranges.

The demonstrator will first see to it that the gas supply of the range is correctly adjusted, that the maximum results may be obtained with the gas consumed. A great many ranges are operated wastefully, the company believes, and the housewife will be instructed so that this evil may be wiped out. In some cases burners are operated with too high a flame for service required. In other cases incorrect adjustments give too meager a flow; utensils are of the wrong shape or size; ovens are operated unskillfully. The results of these and other errors of practice show in unsatisfactory cooking.

The demonstrator, upon application at the office, will visit the homes without charge. She will actually demonstrate the use of burner or oven by cooking whatever may be intended for the day's meals.

In the beginning her services will be given first to new ranges as they are installed. Then will come the ranges already in use, with which the owners cannot get the satisfaction they require. As soon as the system goes into effect, which according to present plans will be in the near future, applications for demonstrations will be received and will be responded to in sequence.

New Water-Gas Set for Rapid City

A new water-gas equipment for the Rapid City (S. D.) Gas & Heating Company is now being installed and will prove a great help in handling the growing sendout of this thriving Western city.

The machine selected is the latest type of carbureted water-gas apparatus, and includes a high-speed blower direct connected to an electric motor, together with steam-operated coke hoist and a standard charging bucket.

This equipment is being installed by the Western Gas Construction Company, of Fort Wayne, Ind.